Vol. 24 AUGUST, 1904 No. 144

THE FOUNDRY

PUBLISHED MONTHLY BY
THE IRON AND STEEL PRESS CO.
CLEVELAND OHIO

SINCE JANUARY 1, 1902 WE HAVE SOLD ONE FOUNDRY
FOR ONE OF THEIR PLANTS,

237 Bbls. 702 Plumbago

Their last order reads: "Please ship us 50 BARRELS 702 PLUMBAGO. Rush shipment as our supply has run short and *OUR PEOPLE DO NOT WISH TO USE ANY OTHER GOODS*

IF WE CAN PLEASE THIS FOUNDRY TO THIS EXTENT, WHY CAN'T WE PLEASE YOU

Give us a trial. Quality always the same
EVERY POUND GUARANTEED.

The S. OBERMAYER CO.

Chicago **Pittsburg** **Cincinnati**

ORDER FROM THE NEAREST WAREHOUSE
"EVERYTHING YOU NEED IN YOUR FOUNDRY"

ESTABLISHED
1874

Now is the Time to Save and Make Your Foundry Profitable

You can do this by adopting all

MODERN AND UP-TO-DATE LABOR SAVING DEVICES USED IN HANDLING AND MELTING OF METALS

These are fully illustrated in our

GENERAL CATALOGUE No. 40 A

just published and ready for distribution and sent on request with express charges prepaid to any foundryman in the world

THE S. OBERMAYER CO.

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CHICAGO, ILL.
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"Everything You Need in Your Foundry"

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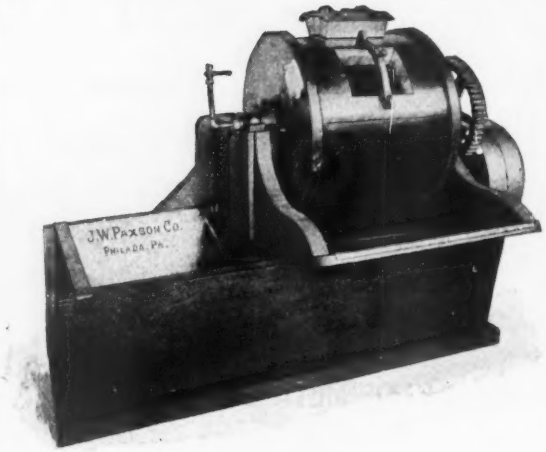

Rumblers
For
Brass Foundry

We carry Several Styles in Stock.

Fig. 210

TUMBLING BARRELS

For Every Purpose.

Ask for Illustrated Catalog.

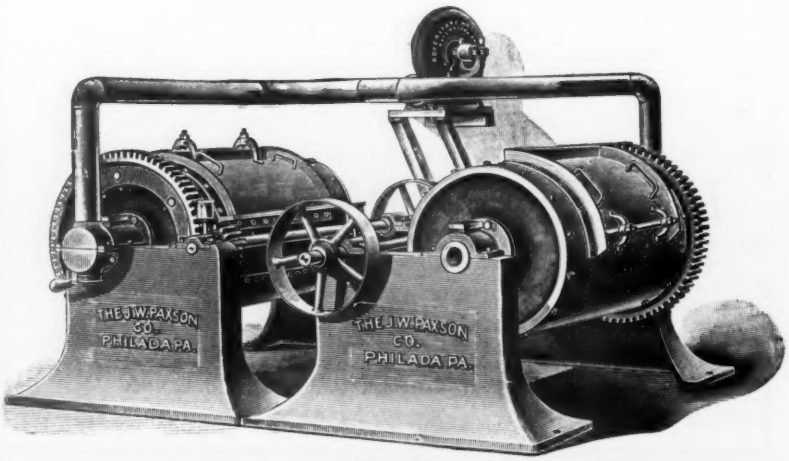

Fig. 193

PHILADELPHIA, PA.

J. W. Paxson Co.

PAXSON-HALL

Molding Machine

as shown in illustration has two tables; one for ramming the cope and one for the drag.

We strip the flask from the pattern, also from the flask pins by the aid of either hand or air lift.

Ask for Catalog.

THE PAXSON-WARREN

Sand Blast Machinery

Patented

American Built

For Cleaning Brass, Iron and Steel Castings.
Removing paint and scale from metals, etc.

Operated by compressed air at pressure varying from 10 to 30 pounds.

PHILADELPHIA, PA.

NEW

Paxson-Colliau Cupola

The more you examine it, the better you will like it . . . . . .

The Acme of Science in Cupola Construction . .

All that was Best in the old Colliau Cupola, with Every Improvement suggested by long experience added.

Location and area of tuyeres insure the . . highest melting . . . . efficiency . . . . . .

It keeps us hustling to fill the orders for these goods.

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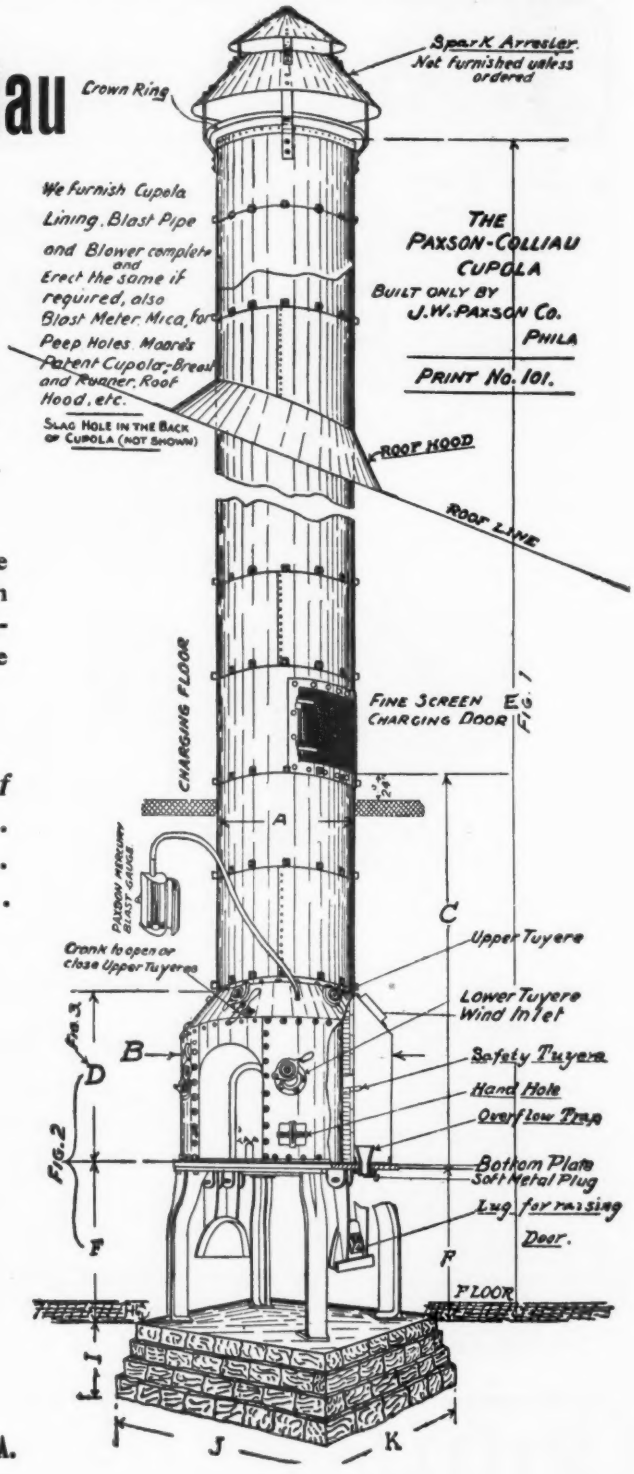

OUR REPUTATION FOUNDED ON MERIT, NOT AGE

We claim to make the BEST PLUMBAGO, FOUNDRY FACINGS and SUPPLIES produced in the United States today. This is a BROAD statement, but the truth permits of no qualifications; we either DO or we DON'T.

YOU WANT THE BEST

We honestly believe that our goods are SUPERIOR to those you are now using. We want you to know this, you to be the judge and decide upon the merits of our claim, after a thorough trial in your own shop on your own work.

Ground Goods

PLUMBAGO
INDIA SILVER LEAD
GRAPHITE
FOUNDERS' PERFECT WASH
CORE WASH
HEAVY MACHINE FACING
RHODE ISLAND FACING
HEAVY STOVE-PLATE FACING
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INGOT MOLD WASH
XXX MINERAL FACING
SOAPSTONE OR TALC
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The Hill & Griffith Co.

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CUPOLAS
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HAND AND POWER SAND SIFTERS
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SNAP FLASKS
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MALLETS
"SMOOTH-ON" IRON CEMENT
CRUCIBLES AND BRASS FOUNDERS' SUPPLIES

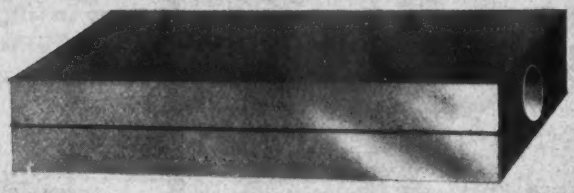
We have the courage of our convictions—what we want you to do is to give the goods a trial, and if, after the test is made, you do not agree with us, we will charge you nothing for the goods, but will expense the cost to over-confidence.

WE SELL THE BEST

Please bear in mind, our prices are no higher than you are paying. We ask for your patronage on the basis of giving you a BETTER value for the SAME money. It's only the first order we are asking for. You will send the others.

PERFECTION CORE BOXES

PATENTED



FOR ACCURATE STRAIGHT ROUND

CORES

FROM ½" TO 6½" IN DIAMETER

ANY LENGTH DESIRED

MOST DURABLE & ACCURATE BOX MADE

HAS NO EQUAL

NO DOWEL PINS TO BREAK OFF

SEND FOR DESCRIPTIVE PAMPHLET

THE J·D·SMITH FOUNDRY SUPPLY CO.

SOLE MANUFACTURERS

CLEVELAND, O.

We are the sole manufacturers of the

Columbia Dry Sand and Loam Facing

And also manufacture many other kinds, such as

COLUMBIA CORE WASH
COLUMBIA RETURN FACING
COLUMBIA FIRE PROOF FACING
COLUMBIA CAR WHEEL FACING
COLUMBIA INGOT MOULD FACING
COLUMBIA HEAVY STOVE PLATE FACING

As well as many others of our SPECIAL FACINGS, and of course we have our

SEACOAL FACING, COLUMBIA CORE COMPOUND and all kinds of FOUNDRY SUPPLIES

ALBANY MOLDING SAND

OF ALL GRADES

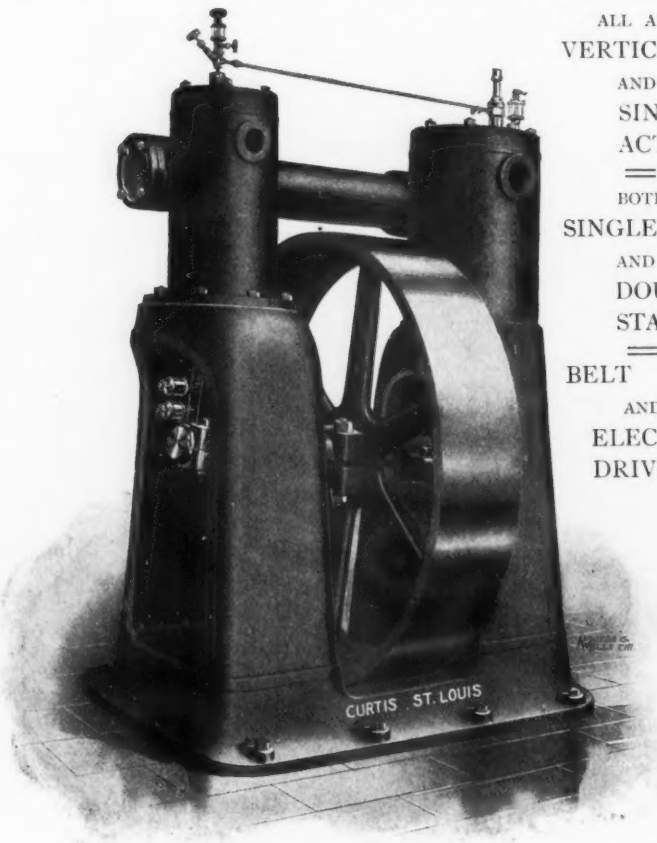
0—1—1½—2—2½—3—3½—4

We bolt our facings finer than other manufacturers, and our product is of the finest quality, so that all can be used and none wasted. If you will give us a trial order, you will buy permanently of us.

BUFFALO FOUNDRY SUPPLY CO.

BUFFALO, N. Y.

THE CURTIS TYPE
AUTOMATIC AIR COMPRESSORS



ALL ARE
VERTICAL
AND
SINGLE
ACTING

BOTH
SINGLE
AND
DOUBLE
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13 - 8 x 12 Double Stage Compressor. 150 revolutions.
138 cubic feet per minute

20 PER CENT SAVING IN POWER

over the ordinary type of double acting single stage

CURTIS & CO. MANUFACTURING CO.

ST. LOUIS

Baird Machinery Co., PITTSBURG . . Strong, Carlisle & Hammond Co., CLEVELAND
Walter H. Foster, New York . . . . . Hill, Clarke & Co., Boston

Loam, Dry Sand Work and Cores

Should be blackened with our

Vulcan Blacking

Hundreds are using it with excellent satisfaction. Why can't you?

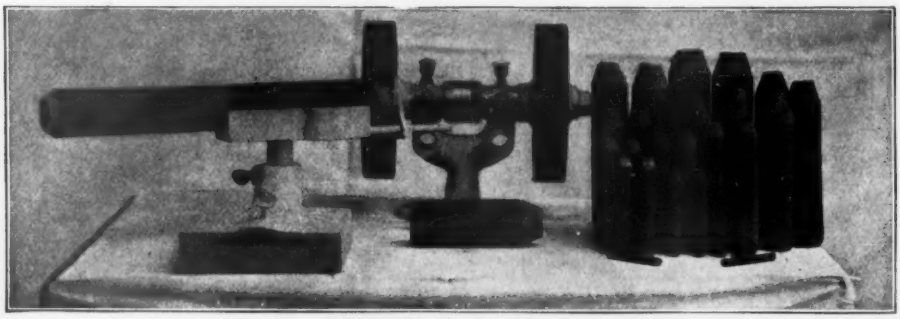
Send for a sample barrel. Freight prepaid. If not satisfactory can be returned at our expense.

MANUFACTURED AND SOLD ONLY BY

J. S. McCORMICK CO.

Foundry Supply Depot. **PITTSBURG, PA.**

Ten Times Stronger Than Hand-Made Cores and Vented End to End.



Grinder For Coning Cores.

THE WADSWORTH Improved Stock and Standard Core Machine

makes sizes ⅜ to 6 inclusive. A 6 in. diameter core 24 inches long in 15 seconds, 200 to 600 ft. of cores per hour or 2,000 to 6,000 feet per day.

PATENTED JANUARY, 1902

OTHER PATENTS PENDING

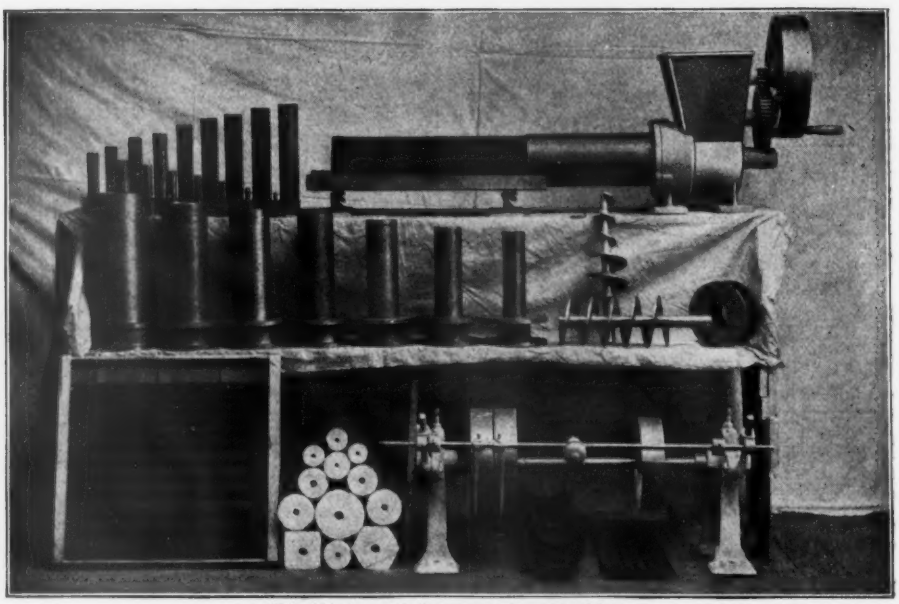
The stock cores are made in 24 in. lengths, baked, and coned with a special attachment, any length and any taper. All cores vented end to end.

We are pioneers in the Core Machine Business and Core Machine Specialists

THE FALLS RIVET & MACHINE CO.

CUYAHOGA FALLS, OHIO, U.S.A.

Better Cores For Less Money.



The Wadsworth Improved Core Machine.

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Our Dry Sand Blacking

The Standard of Foundry Excellence

WHEN you use our DRY SAND BLACKING no time is wasted in investigation or experiment. The article is the result of a series of tests undertaken to find the best article obtainable for FOUNDRY FACING and the result gives us a blacking of the highest economic practical value. Anything having to do with the blackings or leads applied to mold dressing is directly of interest to us, for we deal exclusively in FOUNDRY FACINGS; make it our study and business. We could not afford to carry anything but strictly reliable goods and we are willing to send them on approval to be paid for when satisfactorily demonstrated their worth.

THE OLD WAY was to let the cleaning department scrape and wire brush castings. THE NEW WAY is to have all this done, and well done, by the molder when he applies VULCAN BLACKINGS to the mold.

Insure yourself against defective castings, due to surface dirt, by using blackings for your moulds that are faithfully standing severe tests daily in many of the leading foundries and use the goods with the VULCAN stamp. It is a standard guarantee of material embracing every desirable merit necessary in facings in foundry practice.

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Always on hand ready for immediate shipment in car lots

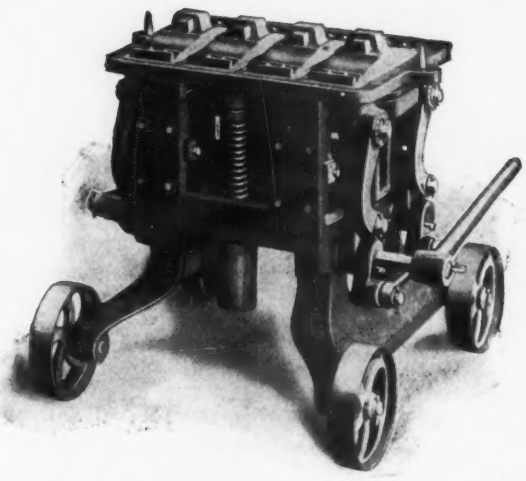
ANTHRACITE BLACKING FOR PIPE FOUNDRIES

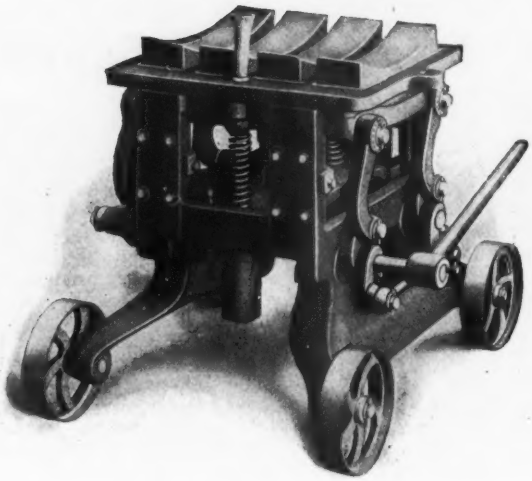
SEA COAL FACING in bags or barrels

Give us a trial order

Our prices are so low and our deliveries so prompt we will surprise you

VULCAN FACING CO. **Easton, Pa.**





A set of 16 x 16 light, double shaft

Pridmore Molding Machines

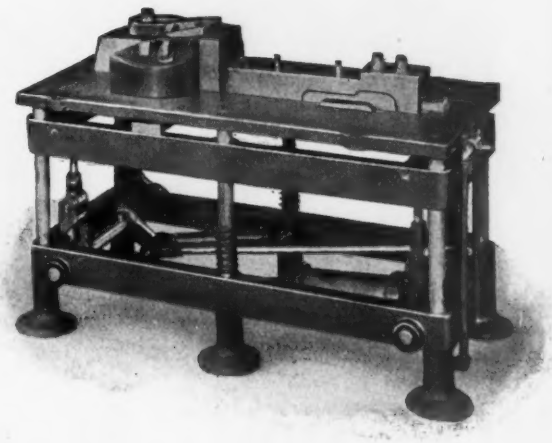
Fitted with brake shoe patterns

We make a specialty of railroad work

HENRY E. PRIDMORE, Chicago, Ill.

Are You in the Ox Wagon?

If BEN HUR had driven an Ox Wagon in his celebrated race, he could hardly have expected to win. Yet *Ox Wagon Methods Prevail* in many foundries today, and in the race for profitable business, many foundrymen are losing ground.



Maywood Molding Machines

will help you to make money on jobs that must be taken at close prices on account of competition. Of course, there are other machines but none better than the MAYWOOD. :: :: :: :: ::

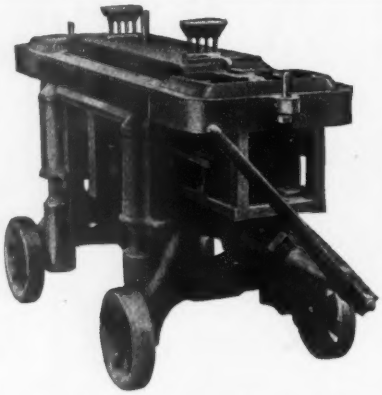
Because

Simplest in construction
Easiest to operate or change patterns
Most accurate in alignment
Most perfect in adjustment

Write today for particulars

Maywood Foundry & Machine Company

1606 Tribune Bldg., Chicago



DRAPER-TABOR HAND RAMMING MACHINE
A PLAIN STRIPPING PLATE MACHINE
—WITH A VIBRATOR IF YOU WANT IT.

A PARTIAL LIST OF THE DIFFERENT MACHINES WE MANUFACTURE:

Hand Ramming Split Pattern Machines
Hand Ramming Stripping Plate Machines
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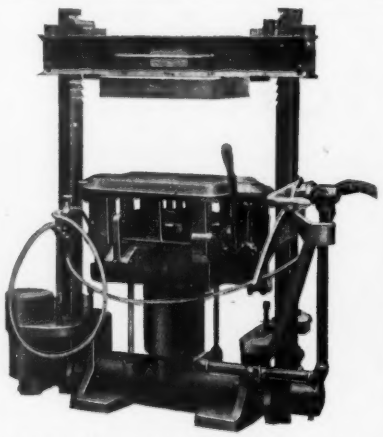
(THOMAS-CLAIRE PATENT)
VERY FAST

MOLDING MACHINES

Power Ramming Split Pattern Machines
Power Ramming Stripping Plate Machines
Power Ramming Vibrator Frame Machines
Power Ramming "Squeezers"
Power Ramming Machines for deep work on which no hand work is necessary regardless of depth. Power Ramming Machines for very large work in flasks 34" x 42" to 40" x 90" for Steel Castings, TUNNEL PLATE SEGMENTS, etc.



LIGHT POWER RAMMING SPLIT PATTERN VIBRATOR MACHINE WITH HAND DRAFT

The Tabor Manufacturing Company

18th and Hamilton Streets, Philadelphia, Pa.

Chicago Office
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Molding Machines

WILL REDUCE

COST of MOLDING

TO INVESTIGATE IS TO
BE CONVINCED

Taylor, Wilson & Co.,

(LIMITED)

101 Grant Avenue, ALLEGHENY, PA.

MOLDING MACHINES

Over 6000 of our machines in use.

See us in the Foundry Building at the St. Louis World's Fair.

The Adams Company,

Dubuque, Iowa, U. S. A.

J. W. Jackman & Co., London, S. W., England
H. Glaenzer & Perreaud, Paris, France
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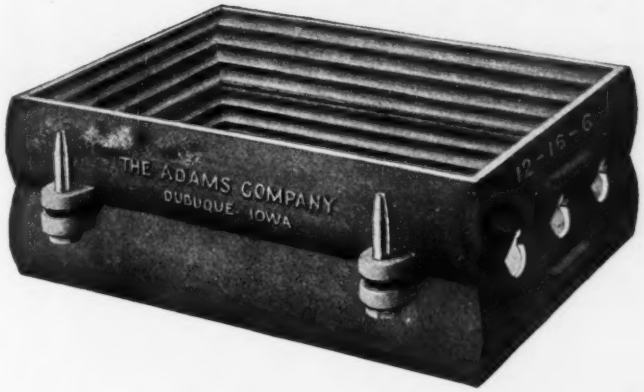
THE ADAMS BRASS MOLDERS' FLASK

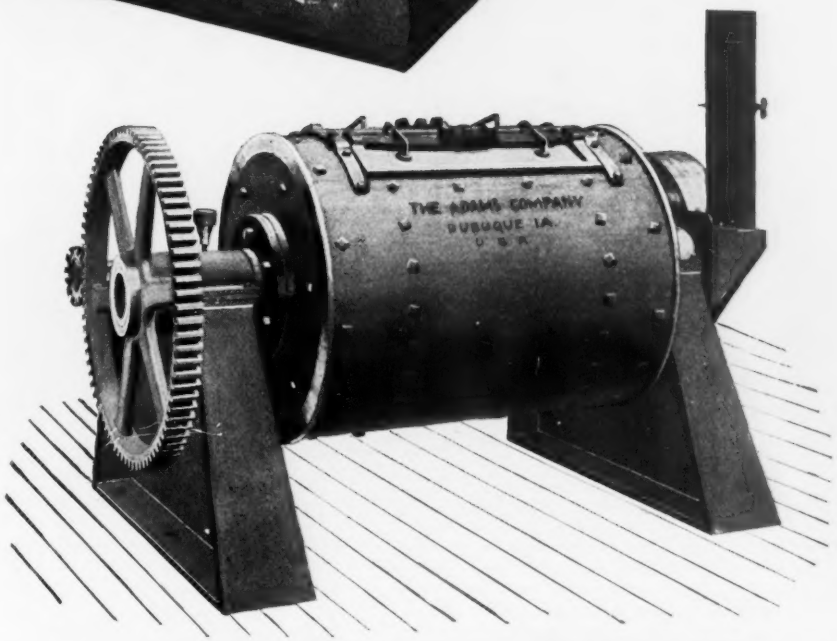
CORRUGATED



These flasks are interchangeable with any of same size.

Each part milled top and bottom.

Send for prices



The Adams Exhaust Tumbling Mills
The Adams Grinding Machines
The Adams Water Mill

Catalog No. 8.

See us in the Foundry Building at the St. Louis World's Fair.

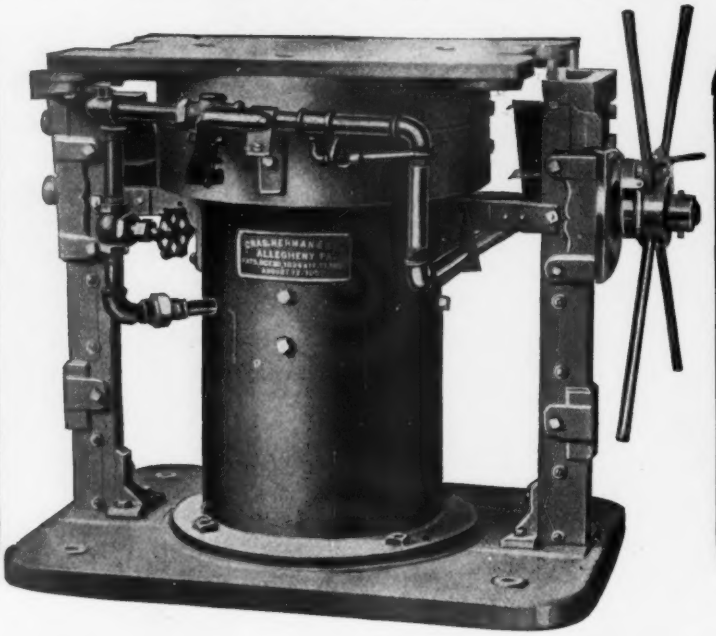
The Adams Company,

Dubuque, Iowa, U. S. A.

Ing. G. Pontremoli & Co., Milan, Italy
Wynmalen & Hausman, Rotterdam, Netherland

The Deeper the Flask The Greater the Gain

Herman Pneumatic Jarring Molding Machine



When machine is installed it is not necessary to wait until stripping plates and interchangeable flasks are made.

Deep drag patterns, that you are using for floor work, may be placed on machine table, the machine does the ramming and the patterns are drawn by hand.

The machine jars or rams up a mold in a few seconds, makes a perfect mold and there is absolutely no blowing or scabbing.

The advantage over hand ramming alone is sufficient to pay the outlay for machine.

One of our customers says he is putting up a day's work the above way, in two hours.

When stripping plates are used, less operations are required and more molds can be turned out.

We lift stripping plates with air hoists attached to machine, requiring no hard work when there is a high lift, and the molds weigh from 200 to 1000 pounds.

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SHARPSBURG, PA.

Pneumatic Engineering Appliances Company, Ltd., Palace Chambers, Westminster, London, Eng., Foreign Representatives

ROOTS'

Established 1859

POSITIVE PRESSURE BLOWER

The only Positive Pressure Blower made with adjustable self-oiling bearings, for regular foundry work. Superiority in all other respects.
Write for catalogue.

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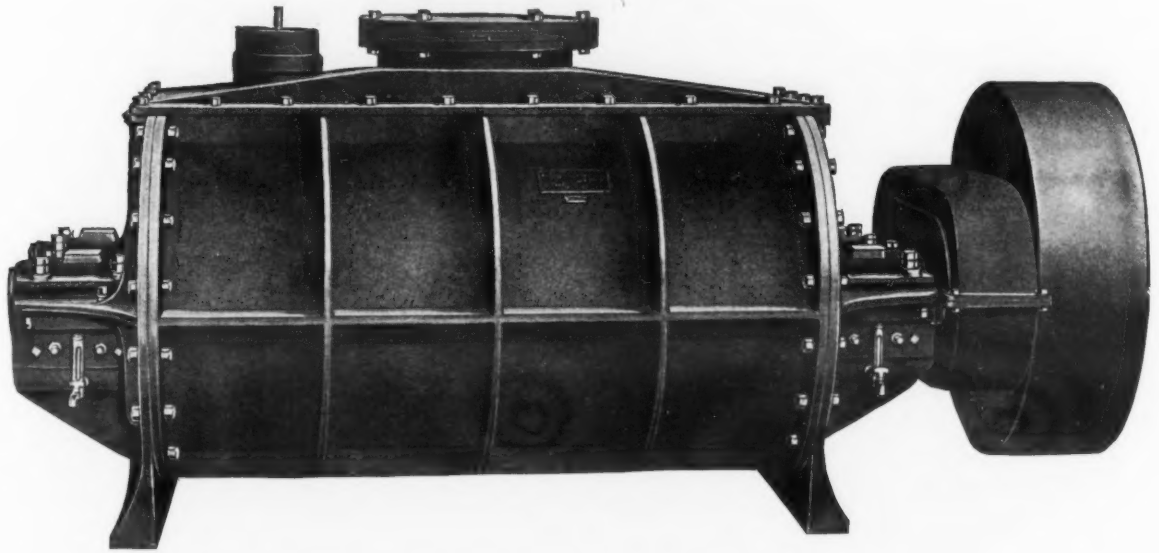
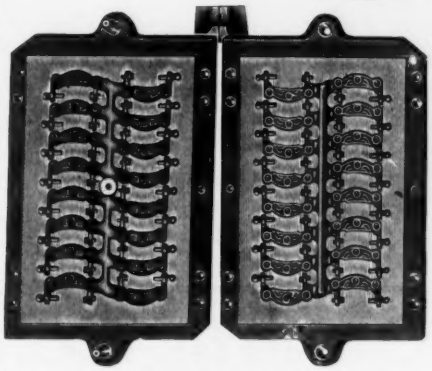


Our Latest Improved Foundry Blower.

The "Modern" Molding Machine

Especially Adapted for Making Small, Light Castings



SPRING HINGE PATTERN MATCH PLATES

The "MODERN" is a Match Plate Machine designed to handle successfully a great variety of snap work. It has many features superior to other molding machines. In our own foundry we have developed a saving in the cost of our castings of 15% to 40%, according to the class of work, and get much more perfect and satisfactory castings.

DIMENSIONS when set up all complete ready for operation are as follows:

Height, 34 inches; length, 49 inches; width, outside wheels, 42 inches; weight, 1050 lbs.

The "MODERN" will take in flasks varying in size from a 10 x 10 to a 14 x 22 inches.

Write for our Catalog and further information

ARCADE MFG. CO. — FREEPORT, ILL.

IT IS SAID An Ounce of Prevention is worth a Pound of Cure.

YET An Ounce of SMOOTH-ON often Saves when a Pound of Prevention Fails.

Before Using SMOOTH-ON Castings

After Using SMOOTH-ON Castings

Our SMOOTH-ON Preparations

are not fillers. Each one is made for use only under certain conditions.

Our SMOOTH-ON CASTINGS is made for the special purpose of repairing castings that are leaky under pressure or having sand holes or blow holes which affect their appearance only.

SMOOTH-ON here makes a permanent repair; in fact, the appearance of the casting in color and finish is the same as if it had been perfect at the start.

We also make SMOOTH-ON for the use of engineers and plumbers in repairing steam pipes, cylinders, radiators; in fact, anything of iron which is not perfect.

Our booklet of SMOOTH-ON Compounds should interest you. Write for it and new quotations.

Meanwhile send for a small can and try its contents when you have trouble. You will soon send us a larger order when you know its good qualities.

Chicago Office, 61 N. Jefferson St. San Francisco Office, 61 Steuart St.

Agents for Great Britain, MESSRS. HODGSON HARTLEY LTD.
55 Victoria Buildings, Manchester, England.

The Smooth-On Mfg. Co.

Analytical and Manufacturing Chemists

JERSEY CITY, N. J., U. S. A.

THE Pulley Moulding MACHINERY

Built by THE E. A. DELANO CO., 50 to 56 S. Clinton St., Chicago, Ill.

IS IN USE IN THE FOUNDRIES OF

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Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.
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W. A. Jones Fdy. & Machine Co., Chicago, Ill.
Southern Engine & Boiler Wks., Jackson, Tenn.
Willamette Iron & Steel Wks., Portland, Ore.
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Pyott Fdy. Co., Chicago, Ill.
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Richmond City Mill Wks., Richmond, Ind.

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GOOD CASTINGS

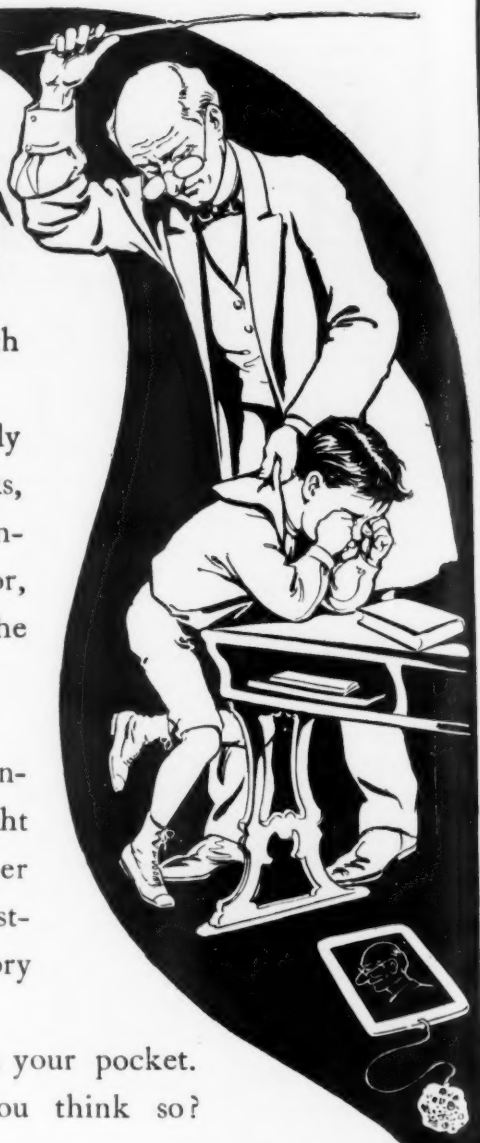
WITH THE

LEAST EXPENSE.

We make machines to cast any size and description of iron pulleys between 3 in. and 72 in.

Our Catalogue P. M.-1 is yours for the asking.

EASY TO CORRECT



all defects in your casting with Clark's Metallic Filler.

It is the only cement you can rely upon to fix all blow holes, cracks, and uneven surfaces in such a manner that it blends faultlessly in color, never becomes white, rusts with the casting and *never* becomes loose.

You know the value of that.

It means you never have to condemn a casting because of slight defects, consequently you never suffer loss owing to defective castings, and the output of your factory can be run to its fullest extent.

That means increased dollars in your pocket.

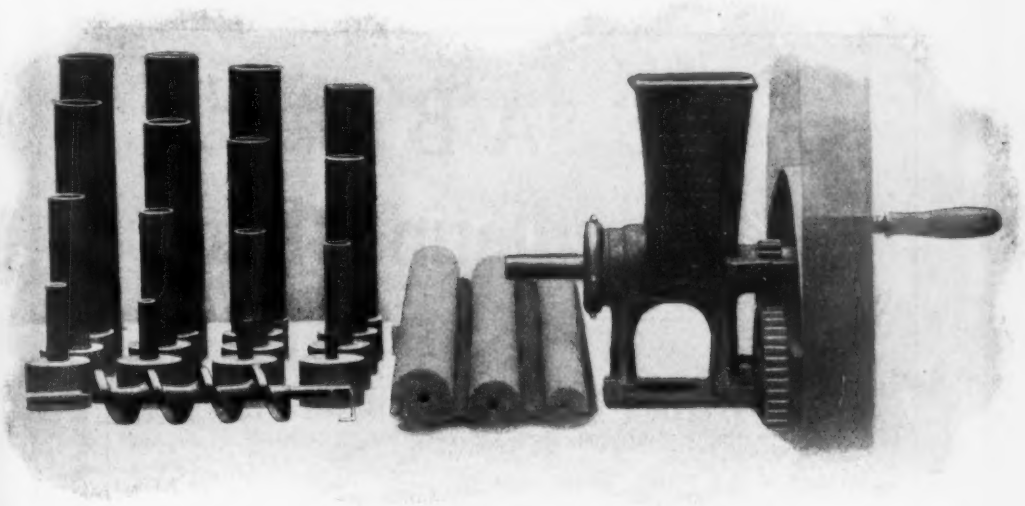
Worth trying for — don't you think so?

Send for a free sample package and see what a wonder Clark's Metallic Filler is.

D. N. CLARK

Drawer 11 **SHELTON, CONN.**

ROUND, HEXAGON OR OVAL CORES, VENTED END TO END



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Suit decided in our favor by the United States Circuit Court, October 13, 1903

Hundreds of Machines in daily use
Cores from 3-8″ to 6″

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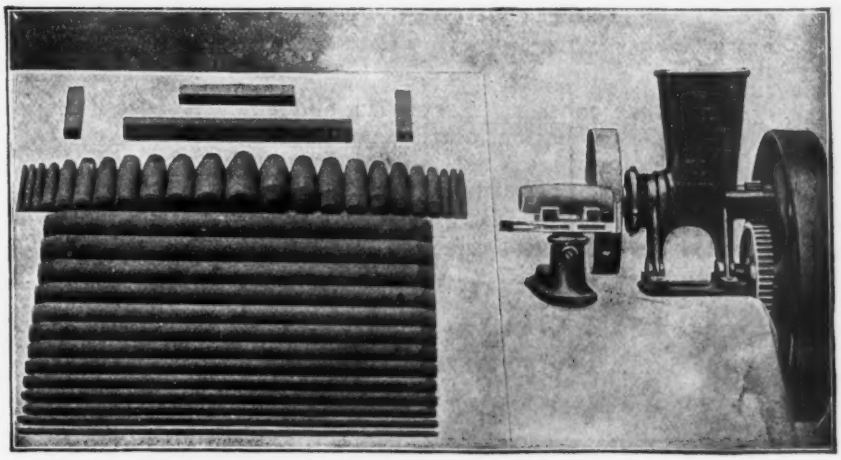
The KENT MANUFACTURING COMPANY

— FORMERLY —

THE RAILWAY SPEED RECORDER CO.

Kent, Ohio, U. S. A.



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The "A B C" Disc Ventilating Fans

WITH DIRECT-CONNECTED

WESTINGHOUSE MOTORS

Form the most rigid, compact and efficient Disc Fan and Motor combinations on the market.

The Motor is mounted on a substantial base instead of being attached to the arms of the Fan.

Low Prices *Quick Delivery*

American Blower Co.

DETROIT

New York **Chicago** **London**

IF it's a

Sturtevant Blower

It's
THE BEST
that good
Materials
and
Workmanship
can
produce

FOR OVER 40 YEARS we have been perfecting these Blowers, studying the trying conditions under which they must operate, making them stiff enough to stand any strain, providing journal bearings so large and oiling arrangements so reliable that they will last a lifetime.

In a word, we have made them PERFECT.

B. F. STURTEVANT CO.

BOSTON, MASS.

General Office and Works, HYDE PARK, MASS.

NEW YORK PHILADELPHIA CHICAGO LONDON

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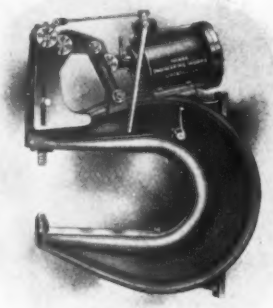
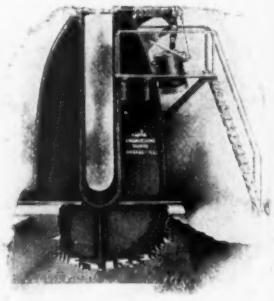


THE HANNA PNEUMATIC



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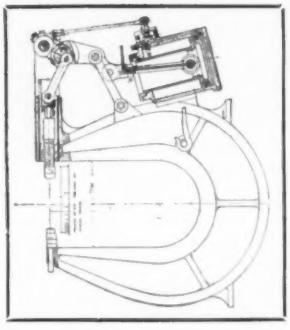
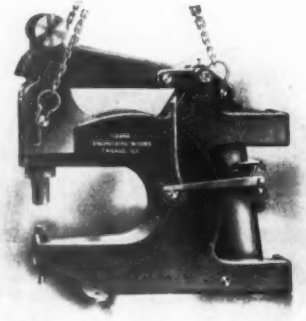
MADE IN ALL SIZES AND FOR ANY PRESSURE



HYDRAULIC RESULTS OBTAINED WITH PNEUMATIC MACHINE

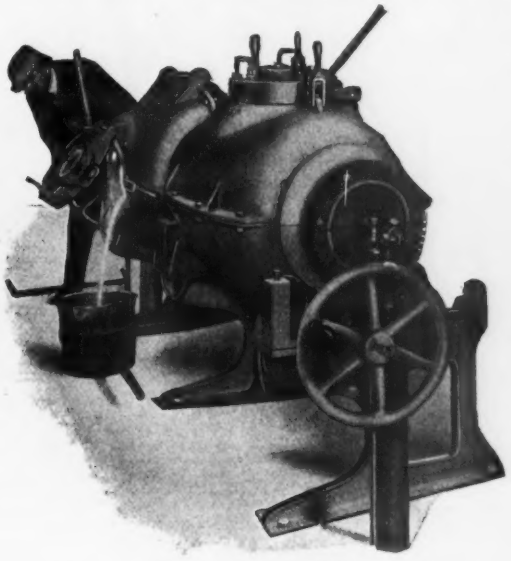


Send for descriptive circular or catalogue

HANNA ENGINEERING WORKS

820 Elston Ave. CHICAGO

Rockwell Rotary Melting Furnace



SAVES TIME, FUEL, METAL, CRUCIBLES AND TEMPER

Melts Continuously

The Rockwell Furnace is a sort of an alternating furnace. The fire is used at one end—the waste heat passing into the next charge—until the melt is completed, then the fire is turned into the other charge, which has already been brought close to the melting point by the waste heat from the other charge, so that the new charge is melted at once, the waste heat acting on the new charge as before, which means a continuous supply of molten metal, without stops or waits.

No Dirt or Loss of Fuel

No coal, coke or like fuel is used, so there is no dust or dirt, or waiting for the fire to come up. The Rockwell burns oil or gas, when not melting there is no fuel cost or loss. Started with a match. Stopped by closing a valve. For convenience, cleanliness and economy, it is unequaled.

CATALOGUE FOR THE ASKING

Made in four standard sizes ranging in capacity from 350 to 3,000 pounds each chamber.

ROCKWELL ENGINEERING COMPANY
26 CORTLANDT STREET
NEW YORK

Any Fool Makes Money

In boom times, but when the time comes that ten men are after every order, then it takes "figgerin."

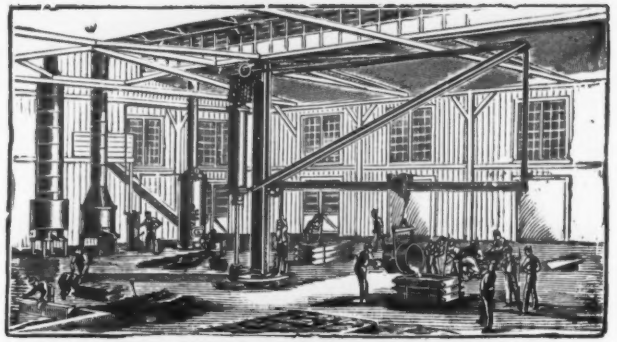
You must save at every point in the cost of manufacturing, just as the other fellow does, or the other fellow gets the business.

There are dozens of places around every plant where Big Money can be saved by setting up Ridgway Steam Hydraulic Cranes.

All that is required is a little steam pipe to the nearest boiler, and Old Mr. Steam does the business without cost.

The Steam Hydraulic Cranes are cheap to buy, Cheap to run, Cheap to maintain, and do the work so perfectly that the only wonder is you do not have them all over the place wherever steam or compressed air can be had.

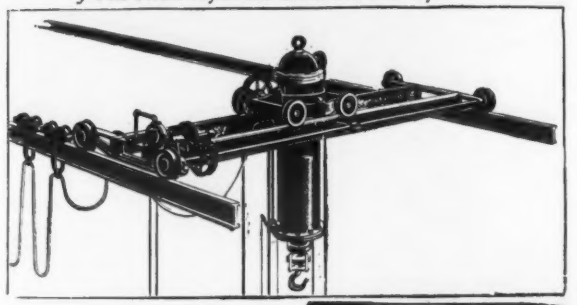
The best plants in the land are getting them.

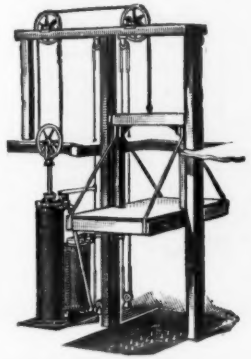


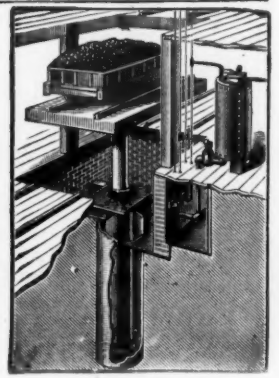
5-Ton Steam-Hydraulic Crane in a Foundry.

OIL GOVERNED AIR HOISTS

A little oil in the piston rod makes the air hoist perfect.
Costs more to make them this way.
Worth the extra cost a hundred times over.
But get one and try it and find out for yourself.







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"Hook'er to the Biler."

CRAIG RIDGWAY & SON CO., Coatesville, Pa.

European Agent, CHAS. G. ECKSTEIN, 49 Kaiser Wilhelmstr., BERLIN, GERMANY.

Hammer Core Machine

Makes perfectly round cores from

$\frac{3}{8}$" to 2-$\frac{1}{4}$" in diameter

Over six hundred in use

ADVANTAGES

No core boxes required	Less oven space needed
No ramming of sand by hand	Less fuel required
No uneven vent holes	Less breakage
No trimming or filing of cores	Less complaint from your customer

Send for catalogue and sample of core

BROWN SPECIALTY MACHINERY CO.

N. W. Cor. Jackson and Clinton Sts.

CHICAGO, ILL.

CAST STEEL CEMENT

FOR CASTINGS OF

STEEL

Don't use a Filler

IRON

COMPOSITION

Write for free samples

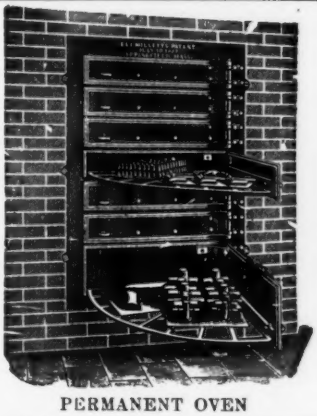
BRASS

The Clark Cast Steel Cement Co.

Shelton, Conn., U. S. A.

Agents: J. W. JACKMAN & CO., 39 Victoria St., London, Eng.
BENJAMIN C. ELLIOTT, 33 Tehama Street, San Francisco, Cal.
J. HOWARD JONES & SON, 355 Dearborn Street, Chicago, Ill.
WILLIAM ABBOTT, 334 St. James Street, Montreal, P. Q.

Good Cores Quick



PERMANENT OVEN

PORTABLE OVEN

The Millett Way

is the way of economy because it produces more and better cores in less time at smaller cost.

Millett Core Ovens

work continuously and bake cores just right in about half the usual time. The hinged shelves swing in and out without a jar, keeping the oven closed whether shelf is in or out. No wasted heat. No broken cores.

THE MILLETT CORE OVEN CO.

Brightwood, Mass., U. S. A.

SALES AGENTS: S. Obermayer Co., Cincinnati and Chicago. J. W. Paxson Co., Philadelphia.
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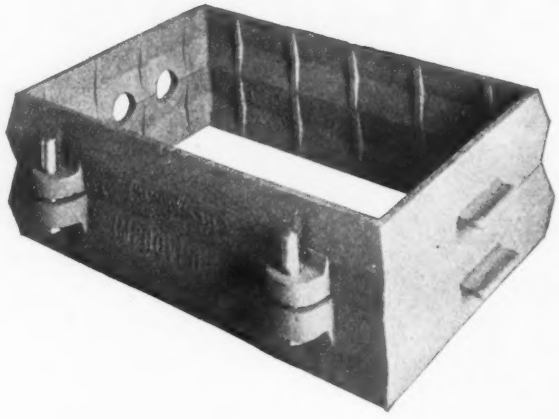
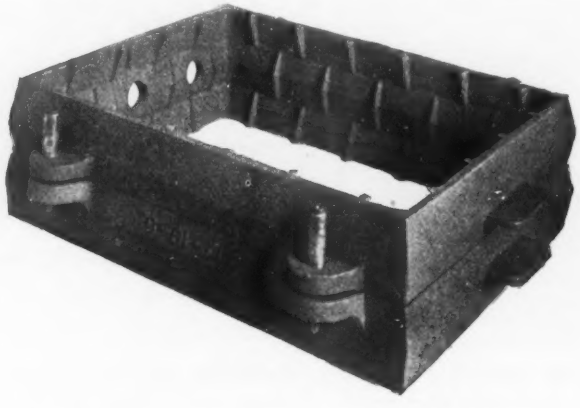


But Never Equalled

Our Improved Ribs prevent shifting and enable us to make a lighter but more rigid flask, which is an important factor even for pouring on the flat.



This lower illustration shows a "Fake" Rib Flask—The Ribs decrease the length and width, each one inch, and annoy the moulder.

Brass Founders Supply Co.

Newark, N. J.

Modern Equipment for the Brass Foundry.

Catalog No. 12.

Always the Same and Always the Best

The standard in soft, strong foundry iron for more than 28 years.

Used by foundrymen who want the best possible results.

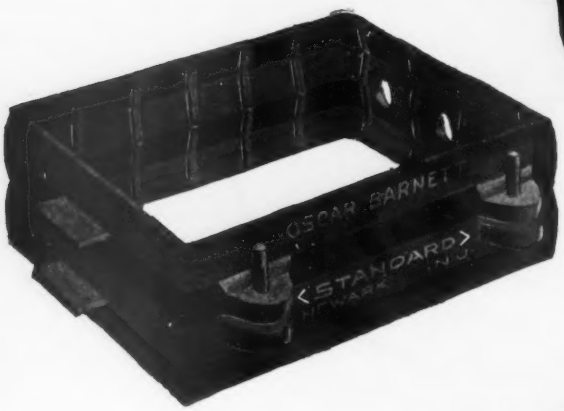
The Cherry Valley Iron Co.

PITTSBURG, PA.

BRASS MOLDERS' FLASKS

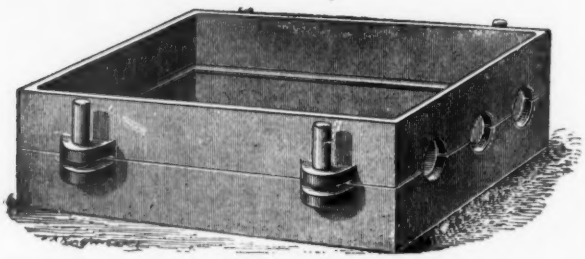
OF EVERY STYLE AND SIZE

Furnaces, Drying Stoves, Spill Troughs, Clamps, Boards, Tongs, Crucibles, etc., etc.



All our flasks interchange with any of same size made by us.

Our own foundries ensure prompt shipments



THE OSCAR BARNETT <STANDARD> FLASK

IS MADE ONLY BY

Oscar Barnett Foundry Co.

Founded 1845

NEWARK, N. J., U.S.A.

PIONEER PIG IRON

Is of the highest grade and always uniform. The ores and fuel used in its manufacture are entirely under the control of the Company and produced from their own mines adjacent to furnaces. If you use Pioneer Iron once, you will always desire to have it in your mixture. No trouble with your castings afterwards. It costs no more and is better than other standard grades. Let us have your inquiries.

For prices write,

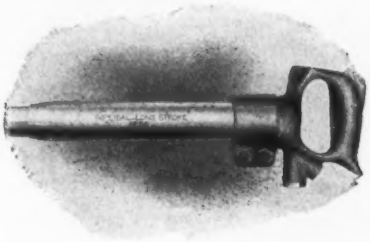
THE REPUBLIC IRON AND STEEL CO.,

CHICAGO, ILL., BIRMINGHAM, ALA.

Or the following Sales Offices:

CLEVELAND, OHIO, ST. LOUIS, MO., ST. PAUL, MINN., BUFFALO, N. Y., CINCINNATI, OHIO, PITTSBURG, PA.

COM-PRESSORS PNEUMATIC TOOLS ROCK DRILLS



GUNS

of a new pattern

¶ Same old name "Imperial"
¶ Same old quality — best.
¶ Made in all sizes for

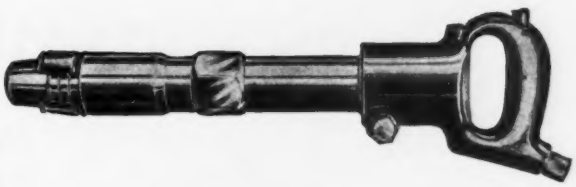
Chipping
Reaming
Calking
Riveting
Etc.

¶ Compressors particularly suitable for Foundries and shops of all kinds where air is used.
¶ Write for Catalog E.

RAND DRILL CO. 128 BROADWAY N.Y.

One of the

Keller Money-Makers



KELLER PNEUMATIC RIVETING HAMMER
MADE IN SIX SIZES

They do more work, in less time, and with less cost for repairs, than any other Pneumatic Hammers made.

Write for Catalogue and Prices of
KELLER TOOLS.

PHILADELPHIA PNEUMATIC TOOL CO.,
21ST ST. & ALLEGHENY AVE.,
PHILADELPHIA.
NEW YORK CHICAGO PITTSBURGH
SAN FRANCISCO BOSTON

William Sellers & Co. Incorp.

PHILADELPHIA, PA.

MODERN FOUNDRY MACHINERY

SAND MIXER

Not an Experiment

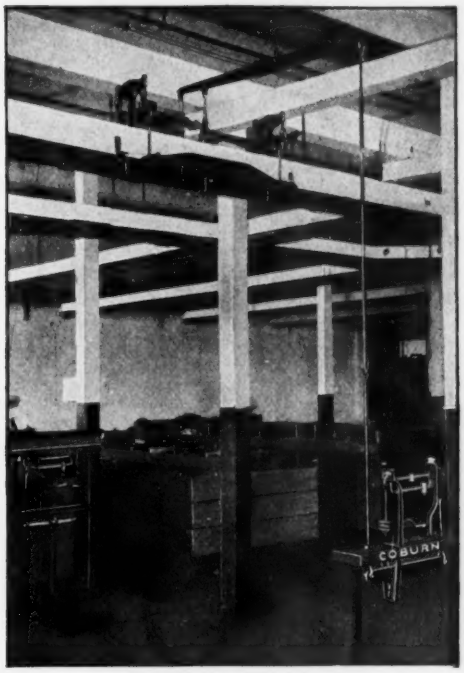
PRACTICAL
ECONOMICAL
EXPEDITIOUS

NOTE. — In order to clearly explain the **Modus Operandi** of this scientific and practical method of **mixing Molding Sand, Facing Sand and Core Sand,** we have issued a small pamphlet which will be sent on application.

TRAVELING CRANES FOR FOUNDRY USE.

Correspondence Is Solicited.

Do Two Things at Once



Move Material Quickly
Get Exact Weight

The combination shown above enables a foundryman to get just the right amount of each brand of iron without extra handling or delay. Same way with coke and other materials.

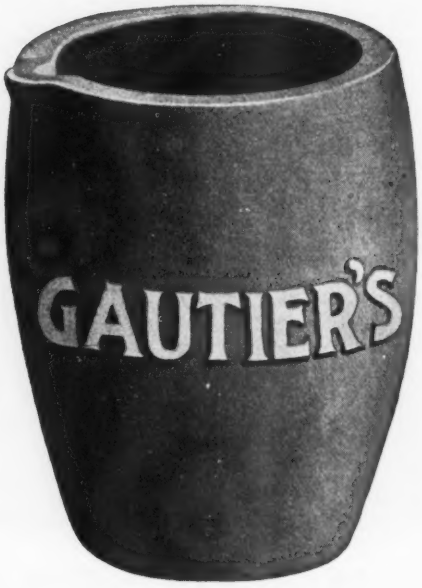
Coburn Trolley Tracks

leave clear gangways and move iron, sand castings, etc., quicker and easier than any other way.

Send for No. 20 Catalogue.

The Coburn Trolley Track Mfg. Co.
Holyoke, Mass., U. S. A.

"Time Trieth Truth"



The Crucible of Satisfaction

Proven so by nearly
fifty years of
satisfactory
service

J. H. Gautier & Co.

JERSEY CITY, N. J.

This trade mark stands for the acme of crucible uniformity.

There's no guess work in the manufacture of a Taylor Crucible. Only the highest grades of material are used, and working strictly by our chemical analysis, we give a uniformity in the quality the year round, that is not approached.

A trial will convince you.

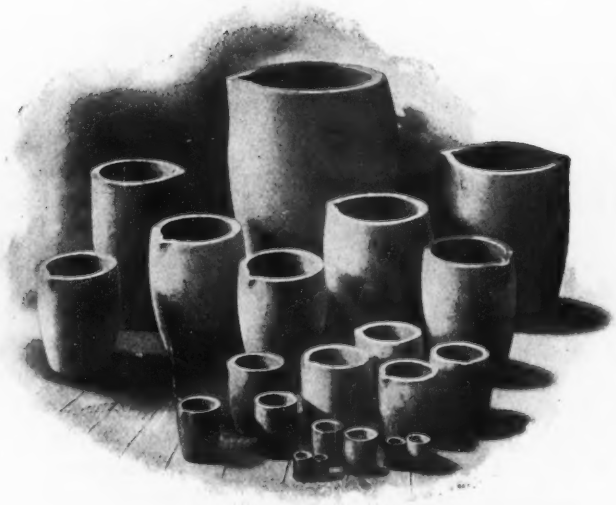
Robert J. Taylor, Incorporated

1900 to 1916 Callowhill Street

PHILADELPHIA, PA.

The Joseph Dixon Crucible Company

can meet every regular and special need of the melter of metals.



Your inquiries will receive our best attention.

Joseph Dixon Crucible Co.

Miners, Importers and Manufacturers of Graphite.

For 76 years
Makers of the World's Best Crucibles.

JERSEY CITY, N. J.

McCULLOUGH-DALZELL
No.
00 TO 300
CRUCIBLE CO
PITTSBURG PA.

Phosphor Bronze

can be made with less energy than formerly — since the advent of McCullough-Dalzell special phosphorizers.
Practical foundrymen know this.
Full particulars will be cheerfully furnished interested parties.

McCullough-Dalzell
Crucible Co.
Pittsburg
Pa.

Five-Motor Electric Traveling Gantry Crane. Capacity fifty tons in middle of bridge. Ten tons at ends of cantilevers. Trolleys: capacity, twenty-five tons each. Total length of bridge, one hundred sixty feet. Furnished Vermont Marble Company. Quarries at West Rutland, Vt.

ELECTRIC TRAVELERS

CRANES OF ALL KINDS

ALL TYPES

ENGINEERS, DESIGNERS AND MANUFACTURERS

COMPLETE EQUIPMENT FOR

GRAY IRON, CAR WHEEL AND PIPE FOUNDRIES

MALLEABLE AND STEEL CASTING PLANTS

1300 IN USE

Catalog "F" on request

See our Operating Exhibit at Model Foundry, World's Fair

WHITING FOUNDRY EQUIPMENT CO.

GENERAL OFFICE AND WORKS: HARVEY, ILL., U. S. A. (CHICAGO SUBURB)

THE FOUNDRY

Vol. 24, No. 6. CLEVELAND, OHIO, AUGUST, 1904. Whole No. 144

Brass Foundry of the General Electric Co., Schenectady, N. Y.

Any foundry connected with a large manufacturing company would generally be considered a specialty foundry, as they deal only with the line manufactured by the company operating the plant. In the case of the foundry under consideration, the variety of work is so great that in many ways it exceeds that met with in the ordinary jobbing foundry. The castings vary from the smallest kind of card or pattern plate work, in which it takes a large number of castings to weigh one pound, up to castings of 1,200 pounds weight, 800 and 900-pound castings being quite common. It is natural that a plant handling such a variety as this should have an equipment which has been carefully worked out and arranged to meet the various requirements.

MOLDING MACHINE SECTION.

Molding Equipment.

The molding equipment consists of 18 molding machines for the standard work, and especially for the smaller work. In addition to this there is a bench or tub molding department, and quite a large area devoted to floor work. Some of the molds are skin dried by means of coke fired stoves. The light work floors are placed in the portion of the foundry nearest the furnaces, while the heavy work is made on the floors located in the extremities of the plant.

Melting Equipment.

The melting equipment consists of a battery of standard type of crucible furnaces and several oil fired melting furnaces. They have installed a number of Schwartz and some Charlier furnaces. The crucible furnaces are used for special mixtures and for much of the very light work where hot metal is required. As the metal from any of the oil fired furnaces would have to be poured into a crucible or ladle for carrying to the mold and this double pouring would result in undue exposure to the air and in a chilling of the metal, the gas fired furnaces are not found suitable for this light work. The majority of the mixtures, however, are melted in the gas fired furnaces. The crucible or pit furnaces are

GENERAL VIEW OF BRASS FOUNDRY.

fired with anthracite coal, using a blast of a few ounces pressure. The exhaust fan which takes the air from the hoods over the oil melting furnaces furnishes the blast for the pit furnaces by deflecting a portion of the air into a suitable duct, the remainder, of course, being exhausted out doors.

SOME FURNACES.

The blast for the Schwartz and Charlier furnaces, of course, is furnished by a regular blower. At present the plant is producing about 20,000 pounds of castings per day.

Handling Appliances.

An overhead trolley track is installed for handling crucibles from the pit furnaces to the molding floors, or crucibles and ladles from the different oil melting furnaces to the molding floors. Suitable hoists are also provided for handling heavy molds or heavy castings on the molding floor. The small castings are handled with trunks.

Cleaning Department.

The cleaning department is located at one end of the foundry and comprises the necessary metal band saws, sprue cutters, emery wheels, etc.

General Remarks.

The foreman's office is situated at one end of the foundry opposite the cleaning department, and in such a position that he has a general view of the entire molding floor.

This plant should be of special interest

to manufacturers on account of the very wide range of castings made, and from the fact that a careful study of the situation on the part of those in charge has shown that it is economy to retain the pit furnaces for certain classes of work, while the oil melting furnaces are found more economical in

MOLDING FLOOR.

the production of other classes. This serves to show that the brass foundry problem in any manufacturing concern must be studied in the light of local conditions and that no hard and fast rules can be given which are applicable to all cases.

PIG IRON AND ITS CONSTITUENT ELEMENTS.*

BY H. L. WILLIAMS, CHICAGO, ILL.

We find pig iron and castings made up in the main of metallic iron, carbon silicon, sulphur, phosphorus and manganese. The other elements, such as titanium, copper, arsenic, etc., seldom being important enough to cause trouble.

Metallic iron runs 92 to 94 percent in our foundry and mill irons. It is the same whether in pig iron, steel, wrought iron, castings, etc. Were it alone to be considered we need not worry about grading by fracture or analysis. We must look for the differences that occur in the various classes of irons, in the additional elements present. To control these foreign elements is the task of the founder.

Carbon is most important in cast iron. Its effect on iron is positive and varied. Free carbon, or graphite, may be either in the pig iron between the crystals, or if in considerable excess, leave the iron at the moment of set, and fly off as "kish." Combined carbon, or the carbon which remains in combination with the iron, is the hardening substance in iron, and when all the carbon is present in that state, leaves it perfectly white. This is turned to practical account in making chilled castings, the effect of a sudden cooling of iron by throwing into water, or casting against a heavy body of cold iron promoting the retention of the carbon in the combined state. In this way car wheels, crusher work, rolls, and the like are made, with iron otherwise gray if left to cool slowly. If a casting is too hard a correction must be sought in freeing more of the carbon and getting it into the graphitic state in subsequent castings. Hence softness and hardness of iron in foundry work is chiefly controlled by carbon.

Silicon in iron frees the carbon, depending upon the amount present, the shape and weight of the casting, and the pouring temperature. In other words the rate of cooling. If the iron is high in combined carbon and hard, add silicon to soften it. It will do this unless prevented by too much sulphur phosphorus, or manganese. If the iron is too soft, reduce the silicon. If the iron is too hard, and low in total carbon, too much silicon is not good, as it is only effective through its action on carbon.

More silicon is required in thin castings than in heavy ones, as the latter cool slower, and give the carbon time to separate out, while the former cooling quickly chill more, and keep the carbon in combination.

Manganese increases the affinity of iron for carbon. In heavy castings it is well to have 0.80 percent, and in light work only 0.50. With these proportions the metal will be clean and strong. Below 0.50 the metal is inclined to sponginess, and above 0.80 there is a chance for hard iron. Manganese also reduces the sulphur present. In chilling work, high manganese gives a strong, hard, sharp chill. It can be used up to 3 percent in such mixtures.

Phosphorus increases fluidity, corrects shrinkage, and is desirable in the foundry up to 0.50 for ordinary foundry castings, and up

*Paper read at A. F. A. convention, Indianapolis, June, 1904.

to 1.25 for ornamental products. Phosphorus hardens iron, and very much of it requires plenty of silicon, to neutralize the effect. Excessive phosphorus with low silicon makes bad foundry work.

Sulphur combines carbon, erratically causing hardness, closing the grain, and weakening the castings. In ordinary castings it should not exceed 0.09, but may go above this in common work requiring no machining. It is the great enemy of iron and should be kept out as much as possible. The fuel is a fruitful source of sulphur, hence this should be watched.

It will be noticed that silicon opens the grain of iron by freeing the carbon, while all the other elements close it by retaining the carbon in combination. In these effects we find the relation of grading by fracture and chemical analysis.

CARBORUNDUM FIRESAND. A NEW REFRACTORY.

BY T. J. TONE.

In all metallurgical operations the question of refractory material is of special importance. In some processes, due to the frequent renewal of the portions of the structure required to withstand intense heat, this constitutes by far the largest item in the cost of operation, and it is therefore a question in which all furnace owners are vitally interested. The proper selection of refractory material, and improvements in the methods of manufacture, are now receiving more scientific attention than ever before, but viewed in the most favorable light, progress can not be said to be rapid. The metallurgist can hardly hope that the perfect refractory will ever be discovered. Such a material should resist the most intense heat without fusion. It should resist all furnace atmospheres, whether reducing or oxidizing. When in contact with the charge, it should withstand the action of various fused substances and scouring slags. It should have mechanical strength, and should not expand or contract unduly in heating or cooling. It should, in fact, be chemically inert and passive in the presence of all substances at all temperatures. In the want of such a substance, it therefore becomes necessary for the metallurgist to make a careful study of the special requirements of his process, and to select from the many substances which nature and science have provided, those which the least imperfectly suit the working condition.

In this connection it is interesting to note some of the special properties of Carborundum firesand, a refractory material of comparatively recent application and of growing importance. Carborundum firesand is an electric furnace product formed at a temperature of between 6,000 and 7,000 degrees Fahrenheit. It is derived from two of the most refractory materials known to the metallurgist, being chemically a compound of carbon with incompletely reduced silica. Although always carrying a certain proportion of free silica, it should be classed with the neutral refractory materials. Among its physical properties, it may be noted that it has a specific gravity of 2.7, is of grayish green color, granular, easily crushed, and of low heat conductivity.

One of the most successful applications of Carborundum firesand, and one of special interest to the foundryman, is its use in the construction of brass furnaces. In the various types of tilting and rotary melting furnaces now being so extensively introduced among brass founders, the question of linings is very important. Oil fuel has superseded coal or coke, the working temperature is considerably increased, and a corresponding improvement in the refractivity of the lining must be obtained. Unless a lining can be produced which has long life and can be easily renewed, all advantages over the old crucible type of furnace in the matter of fuel consumption and increased weight of charge entirely disappear. A magnesite or chromite lining softens under this extreme temperature. No fire brick has been found to give satisfactory results, although silica brick has been applied with some success. The most exacting conditions, however, in the matter of resistance to the high temperature of the oil flame and the scouring action of copper and brass slags are fulfilled by the use of Carborundum firesand. We have here a material by use of which the entire lining may be rammed up in a solid block, having no joints and presenting a smooth glazed surface of good mechanical strength and great refractivity.

In any furnace structure built of fire brick, the weakest points are often at the joints. It is the usual practice to make joints of fire brick as thin and close as possible; but, with the greatest care, these always present to the flame spaces where the volatile fluxes can lodge, and where the slag can scour its way between the bricks, the ultimate result being that the bricks are loosened and the lining destroyed. A most useful property of Carborundum firesand is, that it unites readily with various binding materials. It can thus be

moulded in place in a solid mass avoiding special shaped bricks and the weak feature of joints.

The binder most commonly employed is silicate of soda. This is diluted with water to a thin syrup of a density of about 33 degrees Beaume, and a mixture formed of about 90 parts of firesand and 10 parts of silicate of soda by weight. The constituents, when thoroughly incorporated, form a plastic mixture, which is easily moulded and has sufficient cohesion, when tamped into place, to retain its shape until fired. A center of iron or wood is provided, the dimensions of which conform to the shape required for the interior of the furnace. The firesand mixture is rammed solidly between the center and the iron shell of the furnace, and after the removal of center the lining is dried out with a slow wood fire. The furnace is then brought slowly up to working heat, and can at once be put into service. This method of moulding the entire lining in place has many advantages. The weak feature of joints is entirely avoided. There are no costly shape bricks required, and it is possible, moreover, to obtain the irregular curved surfaces, which are required for the proper deflection of the flame, for the oil ports and for all orifices.

A further and very important factor is that Carborundum firesand has low heat conductivity. While this would be a disadvantage in a material composing a crucible or a muffle, it is of the highest value in a lining of a receptacle serving at the same time as the combustion chamber and the containing vessel for the molten metal. This is well illustrated by the experience of a well known manufacturer of tilting furnaces. With fire brick linings first employed, it was possible to obtain from five to six heats per day. With the first trials of Carborundum firesand nine to ten heats were easily run and he expects to reach a still higher efficiency. The exterior of the furnace is cool enough to rest one's hand on the shell, and the plain inference is that the refractory we are discussing is an exceptionally good insulator of heat.

In making up linings for the ordinary type of crucible brass furnace, the mixture consists of 85 percent firesand, 10 percent silicate of soda, and 5 percent of No. 1 fire clay. A sheet iron form is provided of the same diameter as the interior of the furnace, and the mixture is rammed up between the center and the shell. This lining will last indefinitely without replacement. It requires, moreover, no skilled labor or special brick in its construction, and when worn can be patched and renewed with the original mixture.

A very useful mortar can be made from Carborundum firesand by mixing with it from 30 to 50 percent of No. 1 fire clay. For such purpose a raw New Jersey clay or kaolin will be found well adapted. The mortar is used in laying up fire brick, in patching up holes or joints which have been scoured out, and for general repair work. When thinned down with water, it can be used as a wash or paint on the face of the fire brick, protecting them from the action of the fuel and the heated gases. When applied in this way to the silica lining of a Schwartz furnace, the application being made daily, or two or three times weekly, it has been found possible to obtain a life of 1,000 heats without relining.

In conclusion it may be said that the use of this new refractory is not limited to the applications just described, but that experiments are under way which promise that its sphere of usefulness will soon be widely extended.

A HEAVY CASTING.

The accompanying illustrations show a heavy casting made by the Olympic Foundry Co., of Seattle, Wash., together with the mold and method employed in pouring the same. All who have had experience in the foundry business know that the test of a foundry is often shown by its ability to produce good, heavy castings with a limited equipment; and in many cases a considerably higher expense per pound in producing the casting at a given point is warranted on account of its advantage in regard to freight rates. In other words, our friends on the Pacific Coast, or at isolated points in the west, can afford to put more work on a casting than the large jobbing shops in the eastern portion of the country, where competition is more keen.

The casting illustrated in this case, however, seems to have been made in a remarkably good and cheap manner, considering the equipment available. The description is taken from a letter written by the firm.

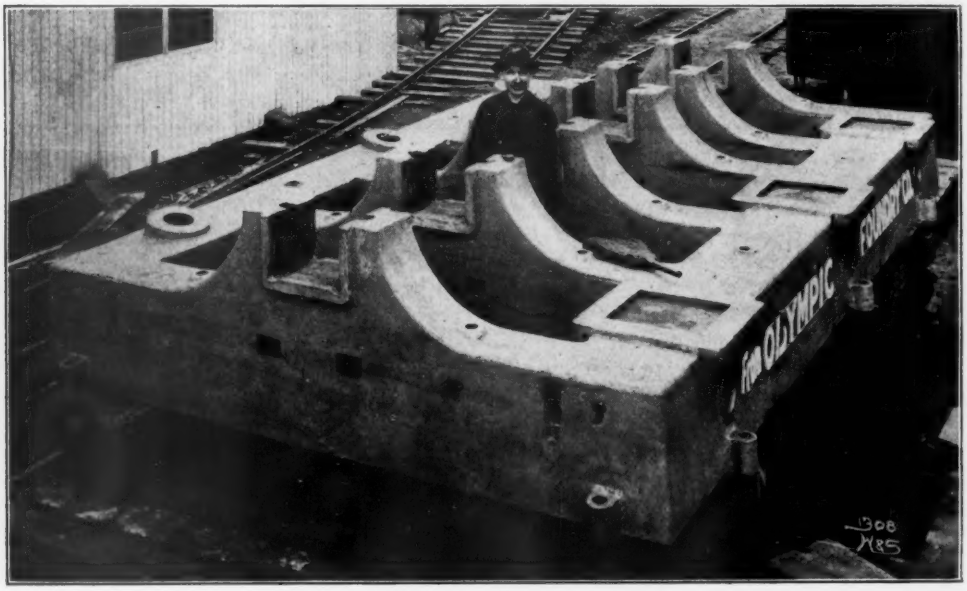
On account of the damp ground it was necessary to build the pit for the drag portion of the casting above the floor like a large drag flask. Six 2 x 8 cast iron stringers were used underneath the bottom of the mold. The bottom, sides and ends were covered with 3-inch plank. The stringers were cast with slots in the ends to receive eyebolts, which were placed on the

outside of the planking and used for tying down the binders across the top of the flask, as shown in one of the halftones. The cope flask bore on the top of the built up flask or pit curbing, the two meeting like the parts of an ordinary flask. A coke bed was put in the bottom on top of the bottom planking and the molding proceeded with in the usual way. The five large openings in the casting were made with green sand, skin-dried cores, the cores being dried in an oven. By using this method, the inside of the mold could be finished to better advantage and there was ample space for setting the dry sand cores.

The interior of the mold was blackwashed and dried by covering the bottom with sheet iron and building charcoal fires inside of it. The fire was kept in the mold about nine hours.

Two copes were used, butting together. The meeting of the handles of the copes left a space of eight inches between them. In this space cake cores were used for covering the pattern and sand rammed in between the parts of the cope, the same as it would have been between any two bars of the cope, though of course this was done after the rest of the mold was completed.

The long cores for the side sections were made in two lengths. On account of the fact that the shrinkages in the length of these two would amount to two inches or more provision was made for it in making up these long cores. In each core a hollow space 2 inches by 14 inches by 16 inches was provided by ramming up a piece of 2-inch plank in the core, drawing it out and filling the space with parting sand to within two inches of the top, then ramming the core sand over, leaving a small hole through which the parting sand could be poured out after the core was dried. After the parting sand was removed the hole was plugged. This precaution may have been unnecessary, but on account of the fact that the metal was comparatively thin, it was thought best to take every precaution possible. It would be interesting to hear from others upon this point.



A HEAVY CASTING.

To take off the gas from the cores, round cores 5 inches in diameter and 7/8 inch thick were placed over openings left connecting with the coke in the large cores. The copes were then tried on for a touch on the same, after which holes were punched through the copes corresponding to these openings. The copes were not dried.

The method used to hold down cores was by placing round cast iron plates 3 inches by 7/8 inch on the cores. These touched in the cope, after which ordinary chaplets were placed over them. With this method there were no chaplets to cut from the castings on the top side.

The mold was poured from both ends, using

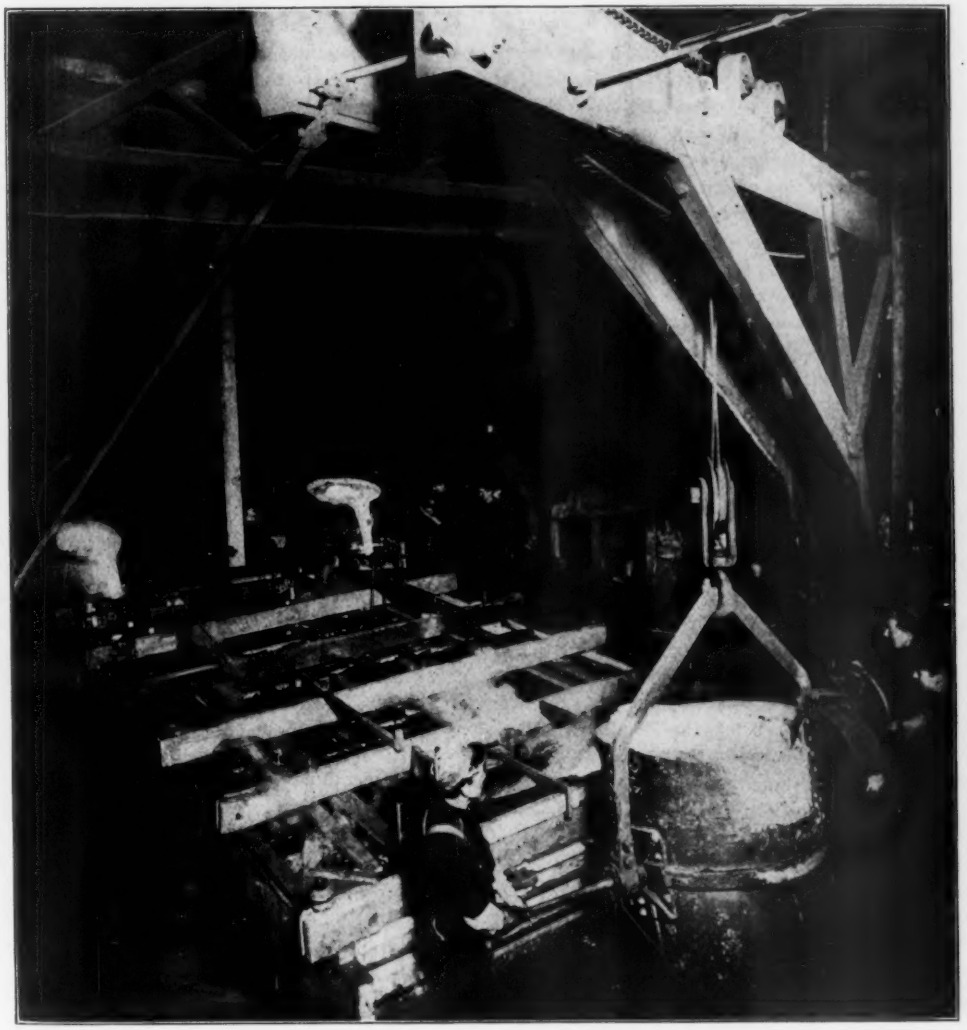
one 10,000-pound ladle carried by a crane and on the other end one 10,000-pound and one 4,000-pound ladle, both pouring into the same runner. These two ladles were hung on chain blocks from trolleys running on the same I beam.

The melting was done with two cupolas, one a 32-inch Whiting with a capacity of 8 tons per hour and provided with a No. 5 Sturtevant blower. The other was an ordinary 26-inch boiler iron shell affair with a capacity of 4½ tons per hour, the blast being furnished by a No. 3 Sturtevant blower. The mixture was composed of half pig iron and half scrap iron. After stopping the furnace the 12½ tons were run out in 2¼ hours.

CORE CRUSH, ITS CAUSE AND REMEDY.

BY WILLIAM LEARY.

Core crush, like accidents, is another name fore carelessness directly or indirectly, traceable to humanity. Patternmakers as a rule work very closely to a drawing's dimensions and while this is commendable they should use discretionary powers and allow a little leeway in core prints and core boxes. They should also have a knowledge of the different ways and means of making cores, also the class of work molds or cores are intended for. For instance cores that are used for crane and side floor work can be made a trifle larger than those for small work, owing to the fact the



POURING A HEAVY CASTING.

molder can shave prints, rap his pattern and so avoid a crush where a bench-molder or machine operator would be powerless to do so except in the case of large work. Then large cores, if round, are generally made in halves or so as to stand on a flat surface, consequently the danger of a ragged or swollen core is reduced to a minimum, while in smaller work cores are made if possible complete and stand on the largest end or the end that affords the most surface and unless that end is rammed harder or the core box a trifle smaller, a swelled or cracked core is the result. The same thing can occur, of course, with a sand too wet. The causes of core crush can in the vast majority of instances, be traced to core boxes too large for prints or patterns or cores larger than the box from which they were made; of course the molders are not entirely guiltless and I will try to show where, and where not they are to blame. As crane and floor work are somewhat similar in regard to operation we will class them together. In the case of a core full to size rapping cope side of pattern one way and the nowel side another will cause a crush, loose dowels on a pattern allowing prints to overlap will do likewise, omitting to shave or chamfer the edge of prints, loose flask pins or pins that are shorter than exposed height of core, core just the length of pattern carrying ends of print down under it on its downward course to its bearings and omitting lifting off the cope and easing tight places like these, are the main causes of floor-molder's crush, unless we add to the list, cores that are not set central. Bench molders are more free from crush generally than other branches (unless cores are too big) because they usually rap both nowel and cope side of patterns at the same time, so if crush occurs with them they have no defence in case of a call down from their foreman. With machine work, whether of the strip-plate or vibrating variety, special attention must be given to the coremaking in order to avoid crush. It does not matter how nice a fit or how true to size a corebox may be, neglect in ramming, having sand between joint of boxes and too wet a sand will all result practically in the same thing, core crush; the reason? These cores generally, unless very large are made by new beginners or apprentices so their work cannot be up to the standard until they are broken in, then again, machine operators as a rule are not troubled with head-aches through excessive use of brains, so there we have it, cores made by incompetent men set by others as incompetent. Other causes are in strip-plate work, failing in the case of a well-worn plate to divide the worn space equally around the pattern. While castings from the same would show more or less of a shift or mismate, this perhaps would not mar the casting if it were not for the crush that accompanies it. This will explain how a core true to size will not crush in the nowel yet will do so in the cope side. Another cause is owing to loose sand getting between the strip plate and pattern so stopping the plate from lowering to the exact half of pattern, this will make mold too shallow, result, commonly known as core crush, and will be found on top or bottom of casting. Short pins and pins tapered too much are also to blame unless a cope is lowered very nicely over them, the core cannot help but crush; we will say a core stands 4 inches above the joint, flask is fitted with pins from 3 inches to 3½ inches long, it is very easy to see how possible it is to get the cope side shifting around to find the pins and by so doing crushing the mold with the core. Having short pins we are well aware may be considered bad practice, it undoubtedly is, but with all that, such things have to be put up with daily in the best of foundries. Now for the long enough pin yet with a good taper, how can that crush? Take the case of a gate valve or a core of like design, here we may have on the core a draft of 1-32 inch on each side of the print and a taper of ¼ of an inch in 4 inches on the pin; how easy it is to carry the cope to one side and hug the core all the way down till centered by the full size of the pin at bottom of joint, after the damage is done.

The remedy for the above evils should begin in the core shop, which should be supplied with gauges of standard sizes, especially in shops where valves and fittings are a specialty. Make the first one as per sketch Fig. 1, same shape as a cone pulley, turn this to standard size as well as a series of rings to fit each size whether it is inches or half inches, then make rods or pieces of pointed iron or steel to fit tightly across diameter of ring. The foreman coremaker or whoever gives out the work could then very easily get, say a four inch stick and try to put it inside the core box, if that can be done, there need be no more time lost, the core box is too large, it is then up to the patternmaker to correct his oversight, (not mistake, they only occur among the molders); if stick will not go in, the core box is in shape

for making a core true to size if the proper care is taken. After a few cores are made and dried the gauge ring comes into play; if the ring will pass over the core print the coremaker has done his duty, if the core will not pass through ring then he may look to his sand being too wet, or insufficiently rammed at standing or supporting end, or particles of sand on joint of core box (taking it for granted that sand is properly mixed by a capable man). In a case of this kind the truest economy is to throw away the cores at once, otherwise cores and castings will be thrown away later on, unless the fault is detected in the molding room. The cores being all right and true to size, it should then be the duty of the core setter, molder, foundry foreman or somebody to go over the first mold made and by calipering the prints on pattern and core see if they correspond as to size. Prints may be too large or too small; how useful the pulley gauge fits in here by putting calipers to fit the print on pattern and trying the same on the gauge will tell in a moment where the fault lies, and whom to blame. If cores and pattern print correspond, don't take it for granted that everything is lovely, because at that moment your cores may be crushing as they say, to beat the band, so cautiousness will dictate the use of a little flour on each print to see whether the core touches at top sufficiently hard to hold it down where it belongs and incidentally to see whether it has crushed in spite of all our precaution. If such should be the case then an examination should be made of the pins of the flask, dowels in patterns or any other cause that you can think of that would cause a mismate of the patterns. In snap flask work, no matter how heavy, this can readily be detected by leaving out the bands, ramming up a mold in the ordinary way, taking off the flask, cutting away at one corner until the mold's aperture is disclosed to the light of day and you have the satisfaction of knowing that you have treed the coon whether you are looking for crush or shift. All the foregoing remedies apply more to machine molding where cores are made entire, made and used by incompetent men, and I find it necessary in order to reduce the scrap pile to surround them with every safeguard that can be practically applied. A molder of experience with care could overcome core crush without my aid, allowing plenty of time for calipering cores, etc. He could also do, as I have frequently, bury a swollen core in a mold and run chances in order to help out a core maker, but at the best, while the intention is good, there is little satisfaction in looking at a piece of work that, owing to the core being too large on being machined, is thrown out because of flat thread or, in other words, not stock enough to make a full thread. Patternmakers could help remedy this complaint a whole lot if they would make their core prints a trifle larger for ½ inch from the end of metal, then continue rest of print to true size. By doing so the core would rest on the extreme end, where it could do no damage, instead of the edge, as is usually the case.

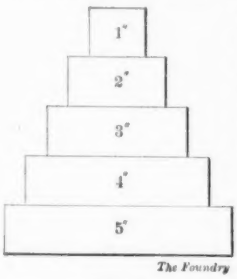


FIG. 1.

ALLOYING COPPER WITH IRON.

The Metal Industry, June, 1904, contains an article in which the writer speaks of the difficulties which have been encountered by those who have attempted to make alloys of this kind, and then states that Mr. Jas. A. Darling, of Philadelphia, Pa., claims to have discovered a process for making alloys of copper and iron which are perfectly homogeneous. The process consists in melting copper with a a mixture of oxide iron and calcium carbide, which gives, after being properly treated, the above mentioned alloy. Any oxide of iron, either hematite or the black oxide, can be used. A mixture of three parts of oxide of iron and one part of calcium carbide is made, and, if it is desired to obtain a 50 percent alloy of copper and iron, 18 parts of this mixture should be used to 8 parts of copper. The copper is melted in a crucible and the mixture added, a little at a time, the bath being stirred and the temperature raised gradually. When the operation is completed, the alloy is poured in ingots or any other desired form.

If an alloy containing as much as 85 percent of iron is required, the process is reversed, a bath of iron being substituted for the bath of copper, and a mixture of oxide of copper and calcium carbide being added. The inventor claimed that, on account of the fact that one of the metals is presented to the other in a nascent condition, a perfect union is formed.

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TRADE OUTLOOK.

Last month we had to report that the trade outlook was unchanged and that the usual summer lull seemed to be on, also that the restriction in the output of the furnaces was going on steadily. This month finds many branches of trade talking of better times and feeling sure that they are coming, but thus far they have not affected pig iron or foundry interests to any great extent. The fact that there is a better sentiment has undoubtedly aided the pig iron producers in holding the prices at or near the cost of production, and it is possible that $9.00 per ton at the furnace for No. 2 Southern foundry iron will not be quoted again this season by large producers in that section.

The southern producers in general seem to have put their price a little high and are asking $9.25 or $9.50 per ton at the furnace, but so long as Central Western blast furnaces are willing to sell at $11.75 at the furnace and in one case at least, 25 cents lower for No. 2 foundry, the southern producers will be unable to dispose of iron in that territory at the figures which they are willing to accept. The final condition of the market will undoubtedly be settled by the northern producers who have very cheap non-Bessemer ores at their command. The northern furnaces have still further restricted the output so that the production has fallen from the rate of 18,000,000 tons per year in March for coke and anthracite furnaces, to an annual rate of 15,700,000 tons in June. Furnaces which were blown out in the latter part of June or have been added to the idle list during July will reduce this amount from 1,000,000 to 1,200,000 tons per year.

Despite the rapid reduction in output, the stock of merchant pig iron reported on hand has increased 75,000 tons during the past month. Some business placed recently has brought out a price of $11.40 per ton at a Valley furnace for No. 2 foundry, or $12.25 per ton at Pittsburg, but at present the producers are asking from $.25 to $.35 per ton higher, making the minimum figure at the furnace $11.75 for No. 2 foundry. At this figure southern furnaces could not compete in northern Ohio and western Pennsylvania at $9.00 Birmingham for No. 2.

The southern coal strike continues and has decreased the coke output somewhat, but Virginia coke can be secured for the furnaces requiring it, so that those furnaces which do not wish to go out of blast have not had to on account of the coke famine.

The Pennsylvania tunnel contracts have been the principal feature of interest in the iron market recently, and after several months' negotiations the castings for both tunnels and the pig iron for the castings are either covered by signed contracts, or the contracts will be placed very soon. The Wheeling Mold & Foundry Co. is reported to have secured a signed contract for a portion of these castings, as noted in *The Foundry* last month. The Davies & Thomas Co., of Catasauqua, Pa., is said to have been given a contract for one-half of the castings for the East river tunnel. This would amount to 54,000 tons. There are contradicting reports concerning the contracts for the balance of the castings, but thus far nothing definite is known, though it is probable that the present month will see some more, if not all, of them closed. Who will furnish the pig iron for the contracts is not yet known, though a number of producers have been asked to figure upon it.

The foundrymen and molders in the various foundry centers seem to be no nearer an understanding than they were last month.

FOUNDRY EDUCATIONAL WORK.

Note by Ed.—This editorial from *The Iron Trade Review* expresses our sentiments so fully that we are glad to reprint it.

Frequent reference has appeared in these columns to the large contribution made by the various foundrymen's associations in the past ten years to the advance seen in that time in foundry practice and equipment. The reproach the foundry has commonly borne and the invidious comparisons drawn between it and the

machine shop, are passing out of vogue. There has been a widespread and a marked foundry awakening. What the foundrymen's associations have done in this direction has been to create and maintain interest in foundry improvement, to bring together practical foundry operators for the discussion of the materials, the mechanical and metallurgical instruments of foundry processes, and of the methods that have given best success, and as a result to create a body of foundry literature that is now the common property of the industry.

Special recognition has been given to the good work of the American Foundrymen's Association both in Germany and England. It is noteworthy that in the effort recently made in England, resulting in the formation of the British Foundrymen's Association, stress was put upon the success of the American Foundrymen's Association. It was referred to as an organization "which has done such satisfactory work in the past and has given a great impetus to scientific thought as applied to foundry operations."

Perhaps it is the old story of a prophet honored abroad but without honor at home; but we cannot refrain from referring in this connection to that portion of the report of Secretary Moldenke, presented at the recent convention in Indianapolis, in which he referred to the very discouraging reception the claims of the association had received at the hands of foundry proprietors in the past year. Letters from foundries solicited for dues or for membership had often contained the statement that they were contributing so heavily to associations dealing solely with labor questions that the modest $5 or $10 asked for the continuance of the excellent work of the American Foundrymen's Association could not be afforded. The policy is certainly a short-sighted one. It would be hard to over-estimate what the educational work in respect to the foundry industry in the past ten years has done for the solution of the very questions that in the minds of some are only to be handled by defense organizations with large outlays of money. Bad practice and poor equipment are responsible for a large proportion of the so-called labor troubles, and it will be found generally true that the foundryman who is slowest to catch step with the improvement procession is the one most frequently involved in difficulties that, while ostensibly over wages, would be very readily adjusted if shop conditions were half way right.

It is a mistake to think that organization for fighting operations is the paramount issue with foundrymen. A sober second thought will suggest that without leaving the work undone, that which the national and the local foundrymen's associations are carrying on for the betterment of practice demands also to be done. Already far too heavy a draft has been made upon the generosity and enthusiasm of Secretary Moldenke and the handful of men who have participated actively with him in a work of which all get the benefit while relatively few bear the burden of support.

EDUCATION OF FOUNDRYMEN.

Much interest is being taken in this subject in different parts of the world, and various attempts have been made to solve the problem. In this country the American Foundrymen's Association has been issuing its instruction papers, but thus far these do not seem to have attained very great success. The International Correspondence Schools of Scranton, Pa., have spent a large amount of money on an elaborately prepared shop and foundry practice course. While this is a purely commercial enterprise, it has nevertheless seemed to fill the needs of the masses better than any thing else at the command of the general public in this country. The University of Wisconsin, as mentioned in our June number, has attempted to meet this problem with a summer school. The Carnegie technical school now being established in Pittsburg expects to give special instruction along foundry lines.

To all who have been studying these problems and considering the question where our future foundrymen, both mechanics, foremen, and superintendents, are to come from, the article presented in another part of this issue upon technical education will be of interest. In Great Britain and most of her colonies, the night school for all kinds of craftsmen has been the most popular form of education for these classes, and this article shows the success such a school has attained in New Zealand. We all know something of the commercial conditions existing in that country and recognize the fact that New Zealanders are working out many problems which are of interest to all of us especially in the line of government ownership and control, but judging from the article referred to they seem to have encountered some difficulty with their night school problem.

This is an age of intense action and young blood is needed in high positions, on account of the fact that the conditions of life are so

strenuous that it requires no small amount of strength and physical endurance to conduct the operation of our large plants. The question of the supply of future foundry superintendents is an important one. In the past they all came up from the ranks, but modern conditions, such as governing the cupola mixtures and the product by chemical analysis and physical tests, together with the large amount of intricate machinery now installed in many of the foundries, has made it necessary for the superintendent to be not only a molder and skilled in his trade, but to be a mechanical engineer. Even though it be desirable that the foundry superintendent should have had a long and intimate experience in molding, a long experience is not absolutely necessary, though he should have worked in the sand long enough to have become familiar with it and with all phases of the work.

The modern foundry superintendent must have practically the equivalent of a college education, and at the same time be a journeyman molder. This would necessitate the spending of four years or more in a technical school and four years or more at the trade. It would also necessitate a man's remaining in the grammar and high schools long enough to prepare himself for college. It would then mean a period of several years in which he would gain experience in the laboratory, or as a sub-foreman. All this takes time, and the tendency is to cut the term of preparation down to the minimum, so as to bring a man into the proper position for active work at as early a period as possible.

There are two ways of cutting down the preparatory period. The molder may gain the necessary engineering knowledge by night study while at the trade, together with possibly a year or two of special study in some school or college. In this country the correspondence schools, the night schools, and such schools as the new one in Pittsburg, are a great help to those who are following this course. The other course is for the technical graduate to spend a year or two in the shop in practical work. Labor conditions have to a large extent interfered with this arrangement and made it difficult for the college graduate to gain the experience which would make him a much better superintendent, on account of the fact that he would have been a better molder.

Theoretically, the best arrangement would probably be for the young man to leave school either at the close of the grammar course, or after two or three years of high school work and work in the foundry and core departments for, say, two years, then go to college, spending his nine months each year in college and three months of the summer vacation working in the foundry. This would give him nine months more of practical experience before graduation. After this a few years as a journeyman, or working as a sub-foreman in different shops, ought to equip him very well for a position of trust in a foundry. We realize that many young men are barred from this course by financial conditions, but night schools and the correspondence schools will enable such to advance if they have sufficient persistence.

After all the question of whether a man will or will not advance lies almost wholly with himself. The young man who goes to college without having had practical experience rarely, if ever, gains the greatest good from his college course, and the young man who simply tries to get the maximum amount of pay in the shortest possible time in any line of work without making it a special study also, hardly ever achieves success. As has been said you can not catch a boy and cram information down his throat, and it is probable that in the future as in the past, we will find the honors very well distributed between those who can go to college and those who cannot.

EXPLOSIONS PRODUCED BY FERRO-SILICON.

In a paper recently read before the British Iron and Steel Institute by A. Dupre and Capt. M. B. Lloyd, a series of accidents caused by the explosion of drums containing ferro-silicon were described. This matter has resulted in considerable discussion abroad. It seems that a consignment of ferro-silicon packed in drums was discharged Dec. 10, 1903, at the Alexandra Dock, Liverpool. A fire had occurred on the vessel, so that the ferro-silicon was detained on the dock until Jan. 12, 1904. On this date, the 48 drums of the material were removed to a neighboring warehouse. They were seen there by an inspector of the explosives department of the Liverpool Police, whose attention was drawn to them by the strong smell of acetylene gas. This smell it is supposed was due to phosphoretted hydrogen, as the unpleasant odor of acetylene is due to the presence of traces of this gas. While the drums were being rolled from the truck on to the concrete floor of the warehouse, a violent

explosion occurred, followed by flame. The drums were then removed to an open yard, and during this removal, a second drum exploded. The material was then placed in wooden barrels and holes bored in the ends of the barrels to prevent the accumulation of any inflammable gas. Despite these precautions, on Jan. 29th when some of the barrels were being weighed, one of them exploded. The barrel was blown to pieces, and a man thrown seven or eight yards away and so severely bruised that he had to be removed to the hospital.

A sample of the ferro-silicon in question was obtained by the writers of the paper before the Institute and submitted to an examination to ascertain the cause of the explosion. They found that when the material was moistened, even in the cold, an inflammable gas was evolved and that this gas consisted mainly of phosphoretted hydrogen. Neither acetylene or siliciuretted hydrogen could be detected. For the determination of the cause of this explosion the exact composition of the gas is not a matter of essential importance. The main point is that the gas is inflammable and forms an explosive mixture with air. Experiments show that the point of ignition of the gas was considerably below a red heat: indeed, pure phosphoretted hydrogen (PH_3), which is not spontaneously inflammable, is said to ignite at a temperature of 200 degrees C. Such a temperature as this could probably be produced by the friction of the irregular hard lumps of ferro-silicon either rolling against each other or against the sides of the drum when the latter was being moved.

It is interesting to note that in none of their experiments did the phosphoretted hydrogen burst into flame spontaneously, though it is well known that when produced in some ways it will break into flame spontaneously. The experimenters came to the conclusion that the explosion was caused by water entering the drums, attacking the fine material which would be sure to be there as a result of handling, and that the gas, with the air already in the drum, formed an explosive mixture which was ignited by the friction of the hard lumps against each other or the drum.

Mr. G. Watson Gray also read a paper on this subject before the Faraday Society on Feb. 2nd, and he attributes the explosion to the presence of phosphorus, but he found some acetylene and some arseniuretted hydrogen among the gases generated in the casks, though he did not apparently find any acetylene in the gases generated by a sample which he boiled with water in his laboratory. Mr. Gray gives the following analysis of a piece of the metal.

	Percent
Silicon	59.40
Iron	36.85
Manganese	0.08
Aluminum	2.73
Calicium	0.14
Magnesium	0.17
Carbon	0.218
Sulphur	trace
Phosphorus	0.560

This shows that the sample was of more than average purity.

It would appear that this explosion was due not to ferro-silicon itself, but to the presence of impurities, and more particularly to the presence of phosphorus compounds contained in it. To avoid these risks, it seems that it would be best to use materials as free from phosphorus as possible when making the ferro-silicon. Two other suggestions are:——first to fill the drums with some petroleum product of a high flashing point; or second, to submerge the finely divided material in water until action had ceased and then dry it before packing. It is probable that the latter would not be successful, on account of the fact that the moisture could not reach the interior of all of the lumps and they would be sure to break up more or less in transit. Also, the water treatment would be somewhat expensive.

It is certain that any drums used in shipping this material should be made as near water-tight as possible, and strong enough so that they are not liable to be broken while being transported. Another precautionary measure would be to ship the material in ingots covered with tar and packed in drums, but these precautions are only suggestions and it is not known whether they would be successful or not. If carbide of calcium can be successfully shipped in drums it seems that there should be no difficulty in shipping ferro-silicon, provided the same precaution is used and same style of drums employed.

While the above mentioned explosions did not result in any serious damage, they show what may be expected in handling this class of material, and bring out the fact that care should be taken to see that it is kept dry and thoroughly ventilated, and that those shipping or handling it should be very careful indeed to look after the material during the entire handling operation.

STANDARD METHODS FOR MAKING BEDS.*

BY THOS. D. WEST, SHARPSVILLE, PA.

The importance of having standard methods of making green sand beds was first brought out by the writer at the meeting of the New England Foundrymen's Association, in November, 1903, in a paper entitled, "The bottom of a green sand mold." This paper was of such interest to that society that a committee of three was appointed to bring the matter before this convention for some definite action of permanent value to the industry.

In order that I may aid this committee by presenting systems for consideration as standards, I have thought that a treatise showing what my investigations and experience could offer, might not only prove of value to our members, but also impress the general trade with the importance of standards for making beds, at the same time showing the great extent of the subject which can and should be thoroughly systematized.

When it is stated that there are over thirty systematic ways of making beds, to say nothing of the many slip-shod methods that are followed, the average experienced molder who knows but three or four ways of doing such work must concede that there is something yet to learn in the business of making perfect castings.

It is a well known fact that there are few molders who will make beds for the same class of work in the same way. It is also well known that there are improper as well as proper methods followed, the former causing many defective castings, and often heavy losses which might have been avoided had there been standard and systematic plans to follow.

Kind of Beds Used.

There are two kinds of beds used in a large number of foundries. Generally speaking, one is called a *soft* bed, and the other a *hard* bed. The former is used for making "open sand castings," or without a cope, while the latter, as a rule, must be the bottom of a closed mold.

In making either soft or hard beds, means must be provided to give any form that may be desired. As a rule a bed has a plane level surface.

Should a bed be used for open sand castings it is necessary that it be perfectly level, otherwise the castings will be thicker on one side or end than on another. By placing a cope over a bed conditions may prevail which force metal to run up hill, and hence castings of even thickness can be obtained on beds made out of level, which it would be impossible to make on "open sand" beds. Hence the importance of correct work in leveling beds for open sand castings.

Leveling Straight Edges to Make a Bed.

The first requisite in making a true bed is a true level. Then we require three straight edges as seen in Fig. 1, two of which, A and B, are true on one edge, while the third, at C, is true on both edges, and each parallel with the other. In starting to level up the straight edges to make a level bed, it may be necessary to set them in the floor as on the left, or on top as on the right of Fig. 2. In any case A and B should have their ends resting on sand mounds, as at Nos. 1, 2, 3 and 4, in order that either end may be pressed down to obtain a true level, without danger of rocking, as would be the case if the sand were under the middle. The first to be leveled is A, after which B is set on the sand mounds 3 and 4, as near to the level of A as the eye can judge. This done, C is set on the top edge of A and B near one end, and then brought to a level by either building up more sand under the end at No. 3, or by pressing it down into the mound. The end at No. 3 agreeing with the level of the end at No. 2, the level D is then placed as shown, and the end of B at No. 4 brought to a level of Nos. 1, 2, and 3. Sand is now filled in the vacant space between the mounds under the straight edges and tucked up with the fingers to get it all as solid as this can make it. Should the straight edges be in the ground or above it, as on the right and left of Fig. 2, sand is then filled in on the sides and rammed to be in keeping with the form shown by the dotted lines F. In doing all this, after first leveling the straight edges, there is a liability of getting them out of true, and hence to be assured that everything is correct, the straight edges are releveled, and parts found high are pressed down by knocking on a flat piece of wood placed on the upper side of the straight edge, to preserve it from abuse. Some may lift the low end up and try to shove sand under it instead of knocking the high side down, but this will not leave as solid a bed under the straight edge as knocking them down. This must be done in such a manner that the bedded straight edges A and B will not rock. This is avoided by pounding down the middle with the last blows.

*Paper read at A. F. A. convention, Indianapolis, June, 1904.

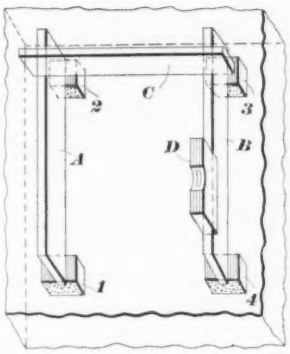


Fig. 1

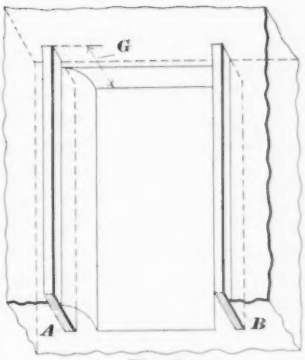


Fig. 3

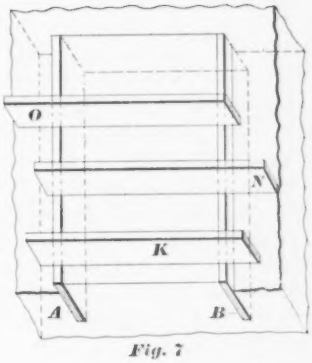


Fig. 7

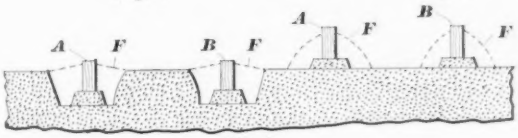


Fig. 2

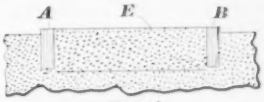


Fig. 4

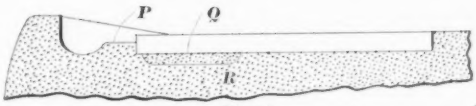


Fig. 8

Fig. 5

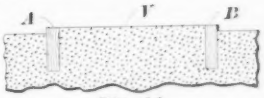


Fig. 11

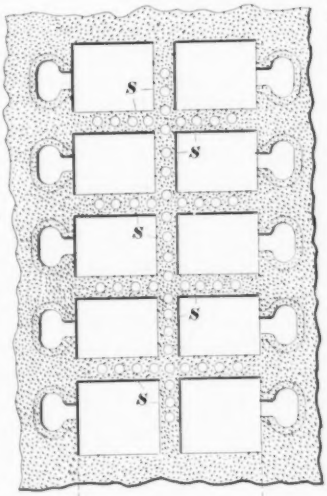


Fig. 12

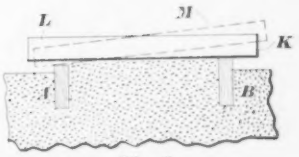


Fig. 6

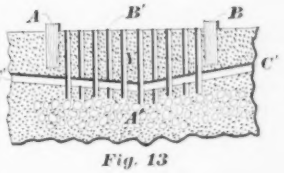


Fig. 13

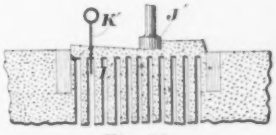


Fig. 16

Fig. 17

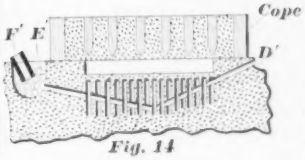


Fig. 14

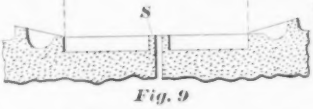


Fig. 9

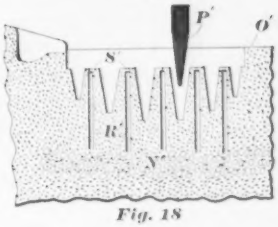


Fig. 18

Fig. 10

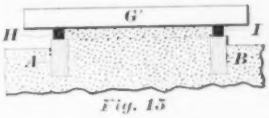


Fig. 15

METHODS OF MAKING BEDS.

Making Soft Beds.

Soft beds are generally labor savers. Their use obviates ramming and venting. There are few, if any, castings made on soft beds that cannot be made on hard ones, were these but thoroughly vented. In making a hard bed a rammer or the feet are used, whereas with a soft bed only the palm of the hands, a flat body, or the edge of a straight edge is employed, the latter being the one most often used. The hardness obtained is all on the surface of the bed, while a hard bed is generally softest on its face, the underlying material being more solid and often as hard as can be made by ramming.

The hardness of the face of a soft bed is generally regulated by the pressure of the palms of the hands, flat board, etc., or the thickness of what is called "knock-down pieces," which range from ⅛ inch to ⅝ inch as the circumstances may require it. A scheme of the sizes being seen in table 1.

After leveling the straight edges as seen in Fig. 1, in commencing a bed that is below the floor level, as on the left of Fig. 2, we have a view something like that seen in Fig. 3, which shows sand dug out between the straight edges A and B for the required depth, as at G. This space is now all filled in with nicely tempered or ½ inch riddled sand and struck off to appear like E, Fig. 4, being careful that the sand is placed in loosely without pressing it down in any manner. Sand is now riddled on through a No. 4 sieve evenly all over the surface of the bed, to a depth of ¼ inch to ¾ inch, as may be required. Or the sand having been riddled on the floor is shoveled on to such a height as may be found practicable. This done, "knock-down" pieces H and I are placed on the straight edge A and B, as seen in Fig. 5, after which a straight edge is placed on top of H and I as shown at K, and a man at each side holding the straight edge in one hand and the knock-down pieces in the other, together pull both along the top of A and B, carrying off the surplus sand that projects above the level of the tops of H and I. It may require two or three strike-off operations to obtain a full smooth surface, as the first pulling drags the sand, and often leaves unfilled sections in the bed that must be filled in with sieved or riddled sand, and which (to become even with the other portions) must be struck off with the strike, as suggested above.

The surface having been struck off, it remains to be pounded down to the level of the tops of A and B. This operation is illustrated by Fig. 6, and is done by first removing H and I, and then with a man at each end of K alternately lifting up one end 3 inches to 4 inches, and pressing it down while the other is held stationary; the dotted line, showing how the now depressed end at L will be lifted, as at M, in its turn to pound down the raised sand. As each end is lifted, it is carried on an angle as far as it can go before its end would be off the straight edge to let it be pressed below the level of the bed.

In selecting knock-down straight edges, they should be taken sufficiently stiff or deep to keep them from bowing in the center while being used. If this occurs it causes the center of the bed to be higher than the outer portions, and hence not be a level bed unless carefully struck off. The depth of the knock-down straight edge should not be under 4 inches for beds under 24 inches wide and for every foot increase in width, the depth of the straight edge is increased 1 inch. For a bed ten feet wide, this would call for the knock-down straight edge 12 inches deep. In thickness they range from 1 inch to 1½ inches, and as the depth increases so should the thickness.

Granting that a knock-down straight edge leaves a bed true in its width, it may even with the best of care leave some irregularities or ridges on its face due to the action of one knock not covering another sufficiently to prevent marks being left on the face of the bed. There is much work for which sleeking over these marks with a trowel will allow a bed to be used without further striking off; but where the quality of the work demands the most perfect bed that can be produced, it is necessary to strike it off after knocking it down. In doing this, the strike is given a forward see-saw motion, one that causes the strike K to be pulled on a slight angle to one side of the bed as at N and then back to the other as at O, Fig. 7. Care should be taken to always have every movement a forward one, for should the strike be allowed to go backward at any time, this would cause the bed at that point to be marked, or to have a slight depression that did not exist in other portions.

The objection to merely pulling the strike K in a straight and forward direction, is the great liability to tear up, or make a rough face on the bed, which could be the cause of scabs or rough castings. After the bed has been all struck off it may be a little rough, where coarse sands are used. In such cases a

thin covering of sand, not more than 1-16 inch thick can be sieved or spread over one end of the bed, and then by starting at this end, it can be see-sawed off for a final finish.

Where the knock-down pieces have been over ¼ inch thick, the trowel can often be used to give a good finish to the bed surface, and this may often be assisted by first spreading on with the hand a very slight scattering of fine sieved sand over the surface of the bed. With knock-down pieces thinner than ¼ inch the surface of the bed is so soft that there is much danger in the sleeking operation depressing it at spots, and thereby causing an uneven surface on the mold's face of the casting.

Regarding the size of the knock-down pieces to be used for a given piece of work, no rigid rule can be given. This depends largely upon the character of the castings to be made and the kind of sand used. For the same cross-sections, one having a coarse grade of sand might use a ½ inch knock-down piece whereas with fine sand might require ¼ in or ⅛ inch pieces only.

By using the thickest knock-down pieces for coarse grades of sand, and the thinnest for the finer varieties, other conditions being equal, the depths for soft beds given in table 1 could be adopted for making open sand castings ranging from ½ inch to 3 inches in thickness. The thinner the castings the thinner the knock-down pieces to be used, as a rule.

It is to be understood that by using the depths of beds or loose sand given in table 1, no venting of any character is required, but where it is practical to lay ¼ inch vent rods 3 inches to 4 inches apart on the solid ground to reach under the entire bed and put 1 inch to 2 inches of sand over them before shoveling loose sand to fill in the bed, the depth given in table 1 could be decreased 25 percent for the smallest bed, to 40 percent for the largest one. Some may drive the vents sufficiently deep under the surface with one vent wire after a bed is made, to not disturb its face, thinking to thereby save the labor of digging out deep beds, or laying down a large number of ¼ inch vent rods as per the above. This, however, is not to be recommended, as there is much danger of the soft sand filling up the vent holes when the wire is withdrawn, and thereby shutting off the intended escape of gases and causing the metal to bubble and boil, with consequent poor castings.

The greatest difficulty in using soft beds lies in the liability of the metal leaving the runner at P to cut and wash away the soft sand fronting it at Q, Fig. 8. In beds above 4 feet square it is generally a good plan to cut out a portion of the bed fronting the runner P for a depth of about 2 inches above R, and then fill this up with all new, or facing sand, packed down with the palm of the hand to the consistency of a hard bed. After this the part in question is vented with an ⅛ inch wire downward and below with a ¼ inch wire to catch their gases. The top of the cut-out portion R is then struck off and finished to correspond with the adjoining level. This allows the portion fronting the runner to stand very rough usage when pouring large plates, and gives them as smooth a surface at this point as is obtained over the general face of an open sand casting. Where this method is adopted very coarse grades of sand can be used for the balance of the bed other than that fronting the runner, which is very desirable for making large plates.

It often occurs that a molder may wish to make a number of fair sized plates on a floor area that will necessitate having a partition of but 3 inches or 4 inches between edges of the plates, as seen at S, Fig. 9. In such cases it is generally advisable to run down a ¼ inch to ⅜ inch vent wire between edges, as seen by the holes shown, because if this is not done, the plates poured last may draw the gases from some that have been poured and thereby raise the center body of the plate casting while in a semi-molten state, making it appear something like the one seen at T, Fig. 10. The above work of down-venting may be avoided by having extra depths of loose sand under the face. Nevertheless, there are cases where it is well to follow the above practice of venting the partitions between plates.

The temper of any sand forming the face of the plate mold, be it open or closed, should be worked as dry as practical. In making plates over 1½ inches thick it may often be necessary to use a facing sand in order to assist the dusted blacking, or graphite, to peel them. In using any facing sand over the general bed it is put on the thickness of the knock-down pieces H and I, a plan which insures its being of even thickness all over the bed. As a rule facing sand is not used on open sand plates unless they are over 2 inches thick. Blacking, graphite, soap-stone, or lime, dusted over the face of any all-common sand beds will generally peel entirely, when under 2 inches thick,

unless it be the body fronting the runner, where a little facing sand can be used, as shown at Q, Fig. 8, to help the blacking, etc., to peel the casting. Then again, a good coat of these materials fronting the runner, may often answer the purpose of facing sand at this point, providing that there is not too large a body of metal washing over it. The safest plan, however, is to use facing sand as described above, and shown at Q, Fig. 8, in connection with the blacking, etc.

The metal to run open sand castings should be very fluid and with good life, as dull, sluggish metal cannot give good open sand plates. Because plates may be made in open sand, is no reason why one can be careless or slovenly about it. It is as creditable to make good open sand work as the closed, and in many cases more so.

Method of Testing the Hardness of Beds.

In obtaining the weight necessary to penetrate beds ½ inch, as given in the above tables, the hardness tester exhibited by the writer before the New England Foundrymen's Association, Nov. 11, 1903, was used. This device was illustrated in the following journals: The Iron Trade Review, Nov. 12, 1903; American Machinist, Dec. 3, 1903; Journal of this Association, January, 1904; The Foundry, January, 1904; London Engineering, Jan. 8, 1904, as well as other publications.

In making the hardness tests given in table 1, a nowel 4 inches deep, 12 inches square was filled with loose sand passed through a No. 8 sieve, and struck off with knock-down pieces H and I varying from ⅛ inch to ⅝ inch in thickness, as seen by the bed numbers 1 to 9, in table 1.

After each bed of soft sand was struck off and knocked down, the hardness tester was placed on the bed and six impressions made, the average of which was taken as the weight given in the third column of table 1.

The hardness tests for tables 2 to 4, were made in the same 4 by 12 inch nowel, as above, the only difference being that the sand was rammed hard up to 1 inch, ¾ inch and ½ inch, respectively, of the top edge. Sand was then passed through a No. 8 sieve, shoveled on, and struck off with the respective knock-down pieces. All of which is shown in tables 2 to 4.

By using care to pull steady at an even speed, one test will agree remarkably close with another, especially when all the sand is used sieved. The tests given show the relative hardness obtained under similar treatment with identical conditions, and what we would expect from the use of different thicknesses of knock-down pieces in general practice.

The only other matter, aside from the above precautions that can cause any noticeable difference in taking tests as given in tables 1 to 4, in different shops, is a variation in the dampness or temper of the sand used. This difference, at the worst, is very slight, and not sufficient to affect the tests to any extent that would be harmful. The system can be made to given an intelligent control on the part of the manager or molder in obtaining any desired degree of hardness in molds never possible heretofore. Should it be desired to omit the hardness tester, this will not impair the value of the systematic methods that are presented here for beds of different character.

How to Designate Kinds of Beds.

In designating the kind of bed wanted, in the case of soft or semi-hard beds, one will refer to both the bed number and the initial. With soft beds, instead of citing No. 1, A, it might be No. 1, D, or any other of the initials of table 1, for the reason that the depth of sand is not always to have its face pounded down with the same thickness of knock-down pieces H and I, as the area of the bed generally regulates its depth.

In designating semi-hard beds treated at the close of this paper, one will in citing the number of the bed which represents the thickness of the knock-down pieces, also give the initial that represents the depth and the area of the bed desired, all of which is given in table 1.

In the case of the hard beds, tables 2 and 4, treated in the following pages, different conditions prevail than with the above beds, and these are such that it is only necessary to call for the number of the bed to designate just what is desired.

While there are thirty different kinds of beds in the four tables given, they all differ sufficiently to cause the skilled and intelligent molder to make a selection, and thus get the one that is best every time he is called upon to make a different job. This will undoubtedly assist to put aside the impression existing in the minds of many, that any old thing will do in the foundry.

Making Hard Beds.

There is less uniformity in the practice of making hard than soft beds, for this reason there is special need of standard or systematic methods to make them. Hard beds are neces-

West's System for Making Soft and Hard Beds.

TABLE 1. SOFT BEDS FOR MAKING OPEN MOLD CASTINGS.

Bed No.	Thickness of knock-down pieces H. & I.	Weight to penetrate bed ½-inch	Initial with equivalent in inches to designate depth of tempered sand in a bed.		Initial with equivalent to designate area of a bed.
1	⅛-in.	4 oz.	A— 5 in.	J—14 in.	S— 2 ft. sq.
2	3/16 "	6 "	B— 6 "	K—15 "	T— 3 "
3	¼ "	9 "	C— 7 "	L—16 "	U— 4 "
4	5/16 "	12 "	D— 8 "	M—17 "	V— 5 "
5	⅜ "	15 "	E— 9 "	N—18 "	W— 6 "
6	7/16 "	1 lb. 2 "	F—10 "	O—19 "	X— 7 "
7	½ "	1 " 5 "	G—11 "	P—20 "	Y— 8 "
8	9/16 "	1 " 9 "	H—12 "	Q—21 "	Z— 9 "
9	⅝ "	1 " 13 "	I—13 "	R—22 "	AA—10 "

TABLE 2. HARD BEDS FOR MAKING OPEN MOLD CASTINGS.

Bed No.	Thickness of knock-down face X.	Thickness of knock-down pieces H. & I.	Weight to penetrate bed ½ inch.	Thickness of castings that can be made on the respective beds.
10	1 in.	⅛ in.	8 oz.	½ in.
11	1 "	3/16 "	1 lb. 0 "	¾ "
12	1 "	¼ "	1 lb. 8 "	1 "
13	1 "	5/16 "	2 lb. 0 "	1¼ "
14	1 "	⅜ "	2 lb. 9 "	1½ "
15	1 "	7/16 "	3 lb. 3 "	1¾ "
16	1 "	½ "	3 lb. 15 "	2 to 6

TABLE 3. HARD BEDS FOR MAKING CLOSED MOLD CASTINGS.

Bed No.	Thickness of knock-down face X.	Thickness of knock-down pieces H and I.	Weight to penetrate bed ½ inch.	Thickness of castings that can be made on the respective beds.
17	¾ in.	⅛ in.	1 lb. 6 oz.	½ in.
18	¾ "	3/16 "	1 lb. 14 oz.	¾ "
19	¾ "	¼ "	2 lbs. 7 oz.	1 "
20	¾ "	5/16 "	3 lbs. 3 oz.	1¼ "
21	¾ "	⅜ "	4 lbs. 6 oz.	1½ "
22	¾ "	7/16 "	6 lbs. 4 oz.	1¾ "
23	¾ "	½ "	8 lbs. 2 oz.	2 to 6 in.

TABLE 4. HARD BEDS FOR MAKING CLOSED MOLD CASTINGS.

Bed No.	Thickness of knock-down face X.	Thickness of knock-down pieces H and I.	Weight to penetrate bed ½ inch.	Thickness of castings that can be made on the respective beds.
24	½ in.	⅛ in.	4 lbs. 4 oz.	½ in.
25	½ "	3/16 "	5 lbs. 0 oz.	¾ "
26	½ "	¼ "	6 lbs. 0 oz.	1 "
27	½ "	5/16 "	7 lbs. 4 oz.	1¼ "
28	½ "	⅜ "	9 lbs. 0 oz.	1½ "
29	½ "	7/16 "	10 lbs. 8 oz.	1¾ "
30	½ "	½ "	12 lbs. 6 oz.	2 to 6 in.

sary where a mold is covered with a cope, as this creates a heavy pressure not met with on the face of the open sand cast mold. Were one to pour an open sand plate made bed with a cope on it, the casting would come out much thicker than its pattern, especially in the center body, which means an untrue casting.

The conditions demanding certain degrees of hardness in the face and under body of a hard bed will depend upon the speed of covering a bed with a body of metal, or pouring, and the pressure that will be brought upon it when the mold is filled with metal. As a rule, the face of a hard bed should be much softer than the under body. It is only in cases where the bed is covered rapidly and a heavy pressure brought upon it, say inside of 5 to 7 seconds, that it is safe to have the face of the bed so hard that it requires a pull of 20 pounds to penetrate it ½ inch. There is work that will require even a harder face or higher pull than this.

By having a system we can regulate the question of hardness to obtain any degree desired. A system that could be adopted universally is illustrated in Figs. 11 to 15. Here at A and B, straight edges are leveled on the plan shown by Figs 1 and 2, for making soft beds. This done, sand is filled in and rammed up solidly to the top, as seen at V, Fig. 11, after which a strike is used to lower the rammed body below the level of the straight edge to a depth of ½ inch to 1 inch, as may be desired, to appear as at X, Fig. 12. Up to this level the degree of hardness desired is regulated by the power upon the rammer, and may be rammed so hard that it is difficult to penetrate it with a vent wire. In no case, however, must venting be omitted in this body, and as a rule the harder the ramming, the closer and more the venting required.

In venting the body Y as shown between the straight edges A and B, Fig. 13, the vent wire is driven down to the cinder bed as at A′ These vents should not be over 1½ inches apart, and make a vented bed appear something like the surface at B′. Where cinder beds are not employed as in A′ then it becomes necessary to connect the down vents B′ with under vents as at C′. These under vents may not be driven until after the bed is completed, straight edges pulled out, and the cope rammed up ready for lifting off. In many cases these under vents may be brought up to the joint of the mold as at D, Fig. 14. Then again, a recess may be made in the floor and filled up with fine coke as at E′. After this the recess and coke are covered up with sand and the vent brought to the surface with gates as at F′, or vents driven from the floor's level down to the coke.

Returning to the subject of compression or ramming of the sand, we are carried back to Figs. 12 and 13. Here the distance between the face at X and B′ respectively, and the top of the straight edges A and B, is to be made or rammed in a manner to carry the molten metal without bubbling or boiling. The bed having been vented as at B′, Fig. 13, the first operation is to close up the top of the vent holes by rubbing the palm of the hand over them. This done, sand (which may be a facing sand in the case of heavy plates or special light work) is shoveled on, to project ¼ inch to ¾ inch above the top of the straight edges and then struck off with knock-down pieces H and I and a strike G′, as at Fig. 15, after the manner given for making the face of soft beds. The thickness of the knock-down pieces H and I, and the depth of the rammed face, which is the thickness of sand ranging from the bottom at X to the top of the straight edges A and B, Fig. 12, is what regulates the hardness of the face of the bed. The less the depth at X and the greater the thickness of the knock-down pieces, the harder the body forming the face of the bed.

Hard beds are used for open sand plates as well as covered ones. This is found advantageous in the case of plates, etc., having lugs, flanges, or projections on them that would require solid bodies of sand around them, and more or less finishing of these parts of the mold with tools. In using hard beds for open sand castings, those of table 3 having the thickness of the knock-down face but ¾ inch are often preferable to those of table 2, as this brings the vented face up nearer to the face of the mold and gives a bed that is not as hard as those of table 4. A point must be specially remembered in this connection, and that is the necessity of closely venting the whole body under the knock-down face, and also the importance of avoiding the use of very fine grades of sand for this surface. Where shops have trouble with fine sands, bank, shore, or other sharp sand could be mixed with the fine molding sand. This matter can also oftentimes be helped by using thinner knock-down pieces for the respective thickness of casting than shown in the last column of table 3, as for example in making a plate 1½ inches thick, the 3-16 inch instead of the

⅜-inch knock-down pieces could often be used, and in designating the bed number, one would merely order No. 18 instead of No. 21 to be used.

It is not expected that by presenting all this material, that it will avoid the necessity of using brains. Far from it. What is given is intended to be a help, and by following the principles advanced, much benefit will result.

Aside from the methods shown in Figs. 11 to 15, and the three tables for making hard beds, we have the butted face bed. This class of beds is made by first ramming up to the level of the top of the straight edges A and B as at V, Fig. 11, and then striking it down from ½ inch to 1 inch, according to the depth of good common or facing sand required, as at X, Fig. 12, after which the body is closely vented, as at B′, Fig. 13. This all done, the top of the vent holes are all closed with the palm of the hand and riddled sand shoveled on and struck off as at G′, Fig. 15. The depth of the pieces H and I, Fig. 15, should be fully 1¼ times that of the struck out depth X, Fig. 12. After the common, or facing sand, is struck off, the butt end of the rammer is used as at J′, Fig. 16, in a way to ram down the face in a regular even manner to obtain any degree of hardness desired, such as may range from requiring beds as hard as Nos. 26 to 30, seen in table 4, and which in the case of very hard beds may call for a pull of 25 pounds. In butt ramming such a surface, care must be exercised not to miss a spot and to avoid going over the same place twice. The butting all completed, an ⅛ inch vent wire K′ is used all over the face to drive vent holes into the main body 4 inches to 6 inches deep, so as to have the face gases find relief through the body vents which will connect with the cinder bed A′ or under vents C′, as at Fig. 13. It is to be understood that one is not expected to have K′, Fig. 16, find a vent hole every time it is driven down as at L′. If K′ never struck an under vent L′, the gases will be able to escape to the under vents L by reason of the porosity of the sand, which in its body between the under vents, if these are not over 1½ inches apart, will give good freedom for the escape of surface gases.

The surface venting finished, the face of the butted bed is struck off smooth in a see-saw manner, after which sand is sieved or scattered on sparsely over the surface with the hand, and then rubbed down with a smooth hard wood block about 2 inches thick and about 3 by 8 inches. This surface is in turn sleeked over with the trowel, and the bed is finished.

In venting butted faces or beds, some will dispense with the use of the second vent wire K′, and vent direct from the butted face, down to a cinder bed A′, or under vent C′, with a large vent wire, and then stop up the top of the large holes left with the point of the finger. This is objectionable for the reason that finger poking can close the tops too far below the surface and should any be missed or not closed tightly, the melted metal could escape to the cinder bed under the vents, thereby causing boiling, scabs, or a "blow-up."

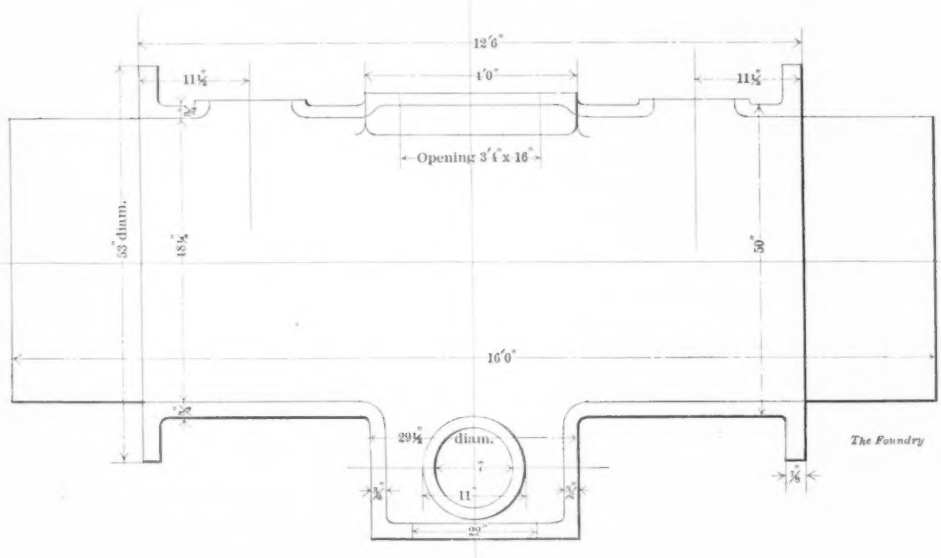
Making Semi-Hard Beds for Prickered Plates.

The most difficult class of work for which to construct beds, is the making of plates used by the molder to carry hanging bodies of sand or loam. These call for prickers which in some cases are very long. At M′, Fig. 17, is seen a long prickered plate, and to cast this successfully, if long, requires careful manipulation to prevent the center of the bed from lifting or blowing when being cast. The difficulty lies first in the necessity of having the bed soft enough to admit of driving long prickers into the sand and at the same time not so soft that the pressure at the bottom of the prickers, when pouring the plate, can strain sufficiently at the bottom to lift up part or the whole center body of the bed. Second, in the excess of gases created by reason of the long prickers often more than doubling the area in which to create gases than would come from a flat plate. Many molders have failed to consider this point, and when pouring the casting, are surprised at finding what metal did not go into bodies of scrap went skyward.

In making long prickered plates it is generally the safest plan to place a cinder bed under the mold, as at N′, Fig. 18. After the cinder bed is in place, nicely tempered sand, dry as can be worked, and riddled through a ½ inch or No. 2 riddle, is shoveled into the hole in about 4 inch courses at a time, until within about 6 inches of the face. These courses are pressed down with the palm of the hands, or by securing boards about 6 by 12 inches to the feet and walking over the soft sand, as one would with snow shoes on soft snow. To tramp about without such boards would make the bed too hard. The last 5 inches of the depth of the bed is made after the system of making soft beds and which includes selecting the number of knock-down pieces, also the initials to designate the depth and area of beds, as given in table 1.

The bed made and side O′, Fig. 18, formed, the next operation is knocking down the pricker patterns P′, of which there should be four or six, so that the knocking down of one pattern cannot burst the sand through to any holes or prickers that have been formed by the withdrawal of a pattern. When all of the pricker patterns are in the bed, the space between them is closely vented with an ⅛ in vent wire from the face of the bed down to the cinders, as at R′, care being taken to avoid placing any vents so near to a pricker pattern as to permit the metal to burst through to them and thereby run into the cinders, filling the space for release of gases. A few of these leaks can make conditions so bad that it would have been better to have had no venting or provision to carry off the gases made in the beds at all. In venting between the prickers the tops of the vents will require to be stopped up by pressure of the finger, and after filling the depression with sand, the body is sleeked over with the trowel. In doing this part of the work, care should be taken to close the top of every vent hole and also not to make the surface any harder than the knock-down pieces used would leave it.

A point, a little aside from the subject of this paper, but well to refer to here, is the danger of metal cutting in front of the runner, especially in large prickered plates. To prevent this the surface fronting the runner is best made entirely of new or facing sand, after the plan at Q, Fig. 8, and as an extra precaution should be surface nailed. Then again, it is best to make the runner where it passes the metal to the mold fairly broad, as a narrow runner at this point confines all the cutting action of the metal within a narrow space, thereby giving a chance for injury to come quicker than would otherwise be the case.



PATTERN FOR CONDENSER.

A PLEA FOR THE COREMAKER.*

BY ALEX. T. NEIL, NEWARK, N. J.

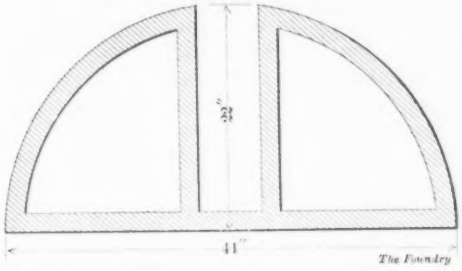
While the technical press is full of articles on molding, I seldom see the art of coremaking commented upon to the extent that its importance warrants. I claim that coremaking is most certainly an art, and to its successful application does many an important foundry owe much of its prosperity.

An experience in molding and coremaking for over thirty years allows me to say very frankly that the coremaker does not get the credit that is due him. He has to work in any old place, use any kind of sand that may be handy, his rigging is often most disreputable, his plates poor, and what lifting is to be done must be tackled by himself, and yet he is expected to turn out perfect cores.

Now why should the coremaker be treated any worse than the molder. If the latter has difficult work, he gets his helper, his facing,

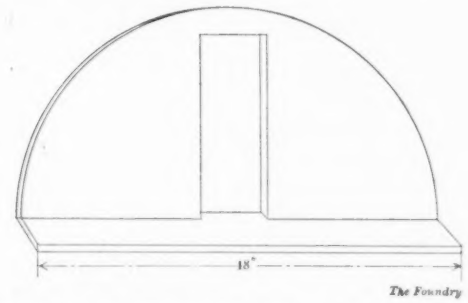
*Paper read at A. F. A. convention, Indianapolis, June, 1904.

and has his iron brought him. The coremaker is blamed if the facing is not O. K., the mold scabs or runs, if the iron is too hot, it cuts, or if too cold, there is other trouble. If the core blows, it is also the coremaker's fault, if it is too big, it is his fault, if the iron gets into the vent, it is still his fault, and so the poor coremaker gets it in the neck all the time.



CLIPS WEDGED TO THE BAR EVERY 6 INCHES.

I had a very old foundry foreman tell me once that I had too many cinders in a 48-inch condenser core about 16 feet long. He held that the accumulation of gas was so great that it swelled in the mold, and robbed him of his metal. He evidently forgot that it was in the molder's hands to relieve the pressure and the



HALF OF END PIECE SAWED OUT FOR BAR TO PASS THROUGH.

real trouble lay in the brick wall built around the core at the ends to keep the iron in. This gave way, and very naturally some iron came out and found its way into the cinders which were acting as a barrier to the run out. This is simply cited as an example of the coremaker's troubles, and is not intended to screen either the careless molder or coremaker. Now if the foreman had put two binders across the ends of his flask and wedged his wall, there would not have been a word lost, and the condenser saved.

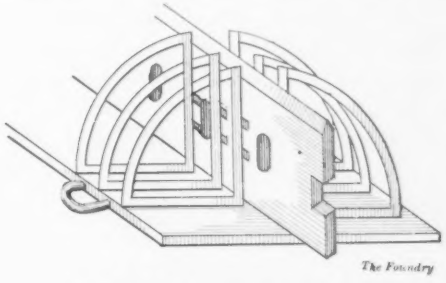
To explain this at a greater length—there was a large nozzle and flange situated on top of the casting, and in forcing the metal up, it was forgotten to secure the two weak spots, the ends. Incidentally the same foreman had me go over the cores with clay-wash while green, and blacking when they were dried. The result was that they came out dirty on top.

I claim that if you clay-wash a core while green, and then black it when it has been dried, you create a parting between the clay-wash and the blacking that will surely wash when the iron touches it. The proper way is to wash or sleek while your core is green, and it will stand the hot metal afterwards without trouble.

I have tried many core compounds, but none

BAR USED IN EACH HALF, HOLES TO CONNECT THE CINDERS.

of them will come up to expectations with the crude methods of mixing in use when it comes to pump cores. Where the sand is crushed and the compound mixed up with it in a thorough manner there will be no difficulty, and at least three of these compounds will beat flour easily, and do away with the blow-holes and scabs we hear about so much. If, therefore, the up-to-date foundry will get a sand crusher, and pay more attention to the core sand, the facings, and see that the sand is kept under roof summer and winter, then



CLIPS AND BAR READY FOR THE SAND.

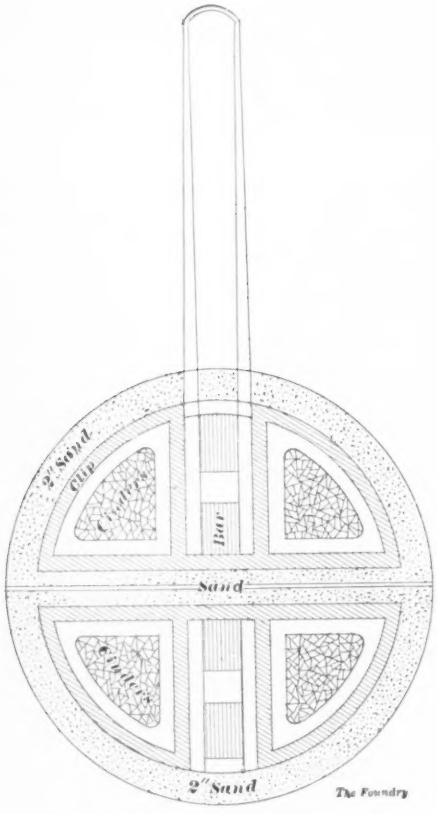
will the foreman get out results, the men be content, and the owners satisfied. Add to this good iron and both the molder and the coremaker will be positively happy.

Good rigging, clean floors, and the like allow the men to interest themselves in their work, and turn out more of it.

Now as to the criticisms about girl-coremakers. Why should this be more so in the

foundry than in any other factory. We tried both boys and girls on small pump cores, with the result that the firm lost 75 per cent. on the small pumps where the boys were responsible, but since the girls were doing the coremaking this loss has been cut down to 10 per cent. Evidently the girl is a success in the core-room of the pump shop, and why not in other foundries. Girls are nimble and work faster than boys, and are easily taught.

Still another point must be touched upon. In case of trouble the foundry foreman will usually take the word of the molder if he complains about the cores, rather than investigate minutely. If he did this, he would not have to send for the patternmaker or coremaker to



SLING FOR LIFTING CORE.

right the trouble. Special attention to these matters on the part of the foundry foreman will save much money to the firm, as he is supposed to know better than any one else in the shop how the cores must fit, how they should be vented, etc.

Where cores are made by the piece work system, in shells or dryers, and baked in the Millet or other oven, it pays to keep track of the plates, which should be made as perfect as possible to begin with, and before they are put away, should be carefully oiled so as to be in good condition when wanted again. Plenty of oven room should be provided, or there will be continuous trouble. There should be special ovens for taking cores which have been pasted, tied, and blacked, and gotten ready for the mold.

Right here is where much loss can be avoided. I think the system in use at the Worthington pump shops for their piecework cores made with stripping plates and dryers, as gotten up by Mr. James Smith, of that company, the most successful and economical I know of, especially as there are so many changes to contend with. For instance take a steam port job, where a journeyman made five right hand and five left hand steam ports, in the regular wooden boxes, for a day's work of 10 hours at $2.50. With the iron stool and stripping plate one girl can make 25 rights and 25 lefts for 2 cents each, size nine inches by six, by 10 inch stroke. That same girl could easily keep two other molding machines going on two smaller sized steam ports, one at 75 cents per 100, and the other at 53 cents per 100. And I could cite many more of such instances which have come under my personal observation.

I can only repeat, that give the girls a good clean room, have their work taken away and the baked material returned to them, give them a special dressing room, and make their surroundings such that it will be a pleasure for them to work in the core-room, and I can safely say that the results will surprise the most skeptical man in the foundry business.

I give herewith some sketches of the rigging used in making the condenser core referred to above. This should become the subject of some discussion, as there are no chaplets used in these condensers, and some of them are only seven-sixteenths thick. These castings used to be made in loam, but cost about 100 per cent. more than when made in dry sand.

Last, but not least, we have the foreman chipper to contend with. His men are all working by the piece, and to get this work done cheaply, he wants special core irons made, so that his men can clean up quicker. Where there is complicated work to be done, many are the woes of the coremaker, but I look forward, nevertheless, to the time when the work of the core-room will be better appreciated than it is at the present day.

SOME LABOR-SAVING SUGGESTIONS FOR THE FOUNDRY.*

BY H. F. FROHMAN, CINCINNATI, O.

Many articles have been written on labor-saving devices, and important facts brought out by able writers, but I desire to put the question before the foundrymen from the standpoint of the practical foundry supply-man, who has had many years' experience, and has visited probably almost all the leading foundries of this country.

I will not dwell on the necessity of having good equipment, such as suitable cranes, designed and constructed for the class of work they are to do, an up-to-date, economical melting cupola, with all the proper appurtenances; nor on a battery of exhaust tumbling mills for cleaning castings; nor on the methods for distributing iron; but will dwell on the minor articles, such as are usually overlooked in the large shop.

I readily appreciate the fact that many foundrymen will say we have all the foregoing, and why should we not produce our castings at the minimum cost? Yet there are many small labor-saving devices that can be introduced, which, used in connection with the more important equipment, and with good management should make the foundry business a successful one.

While foundry supply-men are considered a nuisance by some, to others, we are happy to say, they are heartily welcome. The foundry supply-man is brought in contact with the foreman and molders, and an exchange of ideas has resulted in many a simple and successful device being put on the market to the benefit of all concerned.

While the writer was visiting a certain foundry, he noticed a molder using a perforated piece of tin to hold up the core in the mold. The idea seemed to be excellent, and the explanation of the molder that the tin being perforated allowed the iron to alloy with it more thoroughly than would otherwise be the case seemed conclusive. The suggestion was taken up, and now perforated tin chaplets are on the market in all sizes that are required. Foundries making very thin castings have found them exceedingly serviceable; in fact, they would not do without them if they could help it.

Another simple thing is a core coating. This is used on a steel core, where a number of these may be used in one casting. The method is to dip the steel core into the coating, set it into the mold, and the iron will flow freely around it, making a perfect hole with neither a chill nor a blow.

A mold drying apparatus. This is a device for doing away with burning charcoal in a dry sand mold. It is used with a direct flame from a torch, in connection with compressed air, the result being more economical and satisfactory than the old style.

My attention was also called to the chiseling out of follow-boards and match parts, and after much study and experiment with the assistance of the shop and the laboratory, a compound was gotten up which can be poured into a temporary mold, using the original pattern, and a satisfactory match made at one-tenth the cost of the old method. After setting, this match becomes almost as hard and as true as the iron itself, and makes an excellent follow-board or sand match, which becomes better as it gets older, and retains perfect parting.

In many foundries where dry sand molds are made, it seemed a hard problem to put a liquid blacking on the molds evenly and well distributed. It seems that when this blacking is prepared to use, and allowed to stand a few minutes the blacking settles at the bottom. This trouble is now obviated by using a compressed air blacking swab. This swab mixes and distributes the blacking very evenly over the surface of the mold, and can reach any part inaccessible to the hand. For this reason the result is much more perfect, and the castings brighter, cleaner and better in every way.

I might also mention the various designs of sand-sifters used in a foundry. By adopting these machines, many a dollar has been saved. There are now machines on the market which can riddle as much sand in one hour as formerly required the labor of two men for a whole day. It is also said that these machines temper the sand much more thoroughly. Facing sand may be prepared by them, and their use in the core-room is also highly advantageous for mixing sand with the various compounds, flour, or rosin.

I remember, years ago, there was a certain foundry in Ohio, where they employed girls to make the cores. Should a stray salesman happen to wander in to see the foreman, these girls would spy him, and take all the conceit out of him that he ever possessed. I happened to be in that foundry again a few years later, dreading to approach that core-room, but to my agreeable surprise found the young ladies

*Read at A. F. A. convention, Indianapolis, June, 1904.

wanting, and instead two boys operating two machines for making cores which formerly were made by not less than twenty-five persons. The machines were constantly fed, and as fast as the wheel could turn made satisfactory cores, true and round, and well vented, in fact faster than the molders could use them.

In this same shop, powdered rosin was constantly used, and formerly two men were required to grind it by hand. Later on, a machine was devised for powdering and pulverizing rosin, which operated at a very low cost. It now runs for two hours, in charge of a boy, and produces more powdered rosin than is used for a day.

A word regarding the use of good facings and blacking may not be amiss. I have noticed that where formerly foundrymen used graphite by the pound, it is now used by the ton, showing conclusively that it is more economical to use high grade plumbago to face a mold, at a few cents cost, than to spend dollars in the cleaning room in cleaning and chipping castings. Furthermore, it is to the interest of the foundryman to purchase a grade of facings and blacking suitable to his respective class of work, and the very best is always the cheapest. As advancement has been made in the foundry, so it has in the manufacture of facings and blackings. The materials are turned out with the most modern machinery, and the raw materials kept under chemical control. The foundry-facing man now knows that he is furnishing the proper material for the particular purpose.

Many other simple labor-saving devices could be enumerated by me, as having come under my notice, and all of them would not only become sources of economy alone, but also result in considerable profit to the foundryman.

PATTERNMAKING IN ITS RELATION TO FOUNDRY COSTS.*

BY W. H. PARRY, BROOKLYN, N. Y.

That diverse opinions on the art of molding are sometimes held by patternmakers and molders cannot be denied, and, if by the reading of papers and discussions on subjects of interests to these brother craftsmen, a better understanding will be brought about as to the needs of the foundryman in his endeavor to produce castings at the least possible cost, an immense amount of good will have been achieved at the very outset.

When we consider that a molder is compelled to make castings with practically no means to a successful end than a box or two plus a pile of sand, it is wonderful indeed in these days of keen competition that castings can be made commercially profitable.

In addition to being handicapped by the appliances at hand, the molder has very often to contend with patterns most fearfully and wonderfully constructed in that they cannot be molded in a practicable manner, and, on the other hand, patterns also, most beautifully made but "unmoldable" just the same.

The all too common practice of sending an order for hundreds of castings from one small pattern to be delivered in a day or two, is still with us, and nothing increases foundry costs more than this, except perhaps the good Samaritan who sends to the jobbing foundry a dozen or so metal patterns—minus a match board—so gated that all the dirty metal will enter the mold, thus assuring a high percentage of lost castings.

The loam molder who is fortunate enough to be provided with all the loose pieces necessary to complete his mold, is in luck, and how often does it occur that when the loose pieces are furnished, they do not come within a reasonable distance from his sweeps, or project inward or outward enough to necessitate amputation.

Another fruitful method of increasing foundry costs in connection with loam work is the growing disinclination to make the necessary core boxes, so shaped as to perfectly match the main loam core. The excuse is advanced that there are chippers employed in the foundry for this work. This procedure is the rankest kind of heresy and not fair to the foundryman or the molder who is making his best efforts to cheapen the cost of castings.

The making of patterns without fillets and marking the corners with dotted lines so that the molder is compelled to cut them, cannot be excused upon the ground that there is but one casting wanted, as wood or leather fillets can be bought and applied cheaper than the cost of the molder's time in slicking the round corner.

Unvarnished patterns with glue joints improperly made, or with daubs and beads of glue sticking out, especially in corners where the lift is greatest, does not aid the molder at all. It is moreover worthy of any pattern

*Read at the Indianapolis meeting of the American Foundrymen's Association, June, 1904.

shop foreman's attention to see that patterns do not reach the foundry in this condition.

The use of cheap varnish is to be deprecated for all patterns, the more so on the larger ones that are apt to be left in the sand over night. It entails extra work on the molder in mending the mold, due to the glue oozing through the fresh varnish. In fact, it is not at all uncommon for the pattern to shed a fair proportion of its varnish coat in the mold itself, when exposed to the "touching" effects of moistened sand at night. Hence it would appear to be true economy to use none but the best varnish on wood patterns of all kinds.

The making large patterns in sections so that each part can be drawn from the sand independent of its neighbor, is very often a great help to the sand artist, and if it is possible to do away with deep cope lifts through the medium of suspended cores in the cope, so much the better for the foundry and pattern shop, in many instances.

Again, large or small patterns that are slapped together any old way by men who know better than to expect a pattern to be drawn from the sand without any draft, is very bad practice. It has been my "privilege" many a time to have witnessed good molders attempting to make presentable castings from such patterns, only to have them returned as not being "true to pattern." One case in particular may be mentioned. A cement mill hopper frame some thirteen feet in length, by a width and depth of some six feet or so, was constructed with so little regard to the molder's feelings, that casting after casting was lost, until through the insistent demand of the foundry boss, a few inexpensive core boxes were made, which allowed the piece to be cast successfully and with less trouble and expense.

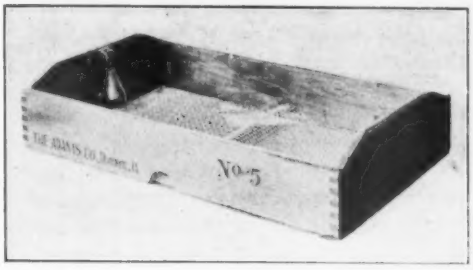
The placing of fillets on core-prints, where they join the pattern, to avoid a "crush" is good practice, and should be universally adopted, at least wnere cores of great bulk rest thereon. While it increases the chipper's work it decreases the chance for lost castings.

On complicated core work time and castings can be saved by having the set of cores made strongly wired without any attention being paid to venting them, and sent to the pattern shop, or any other suitable place, to be assembled on core jigs of wood. Any error can thus be detected and core boxes or core prints corrected while the concrete evidence of errors is present. When the object of these trial sets is explained to the foundryman, he will always be willing to provide them, as it lets him out of a lot of trouble.

To the list of shortcomings incident to the making of patterns could be added many more. The object sought in pointing out these little sins of omission and commission is, that while we have been guilty of these things in the past, there is no reason why they should be continued in the future, if the rising generation of patternmakers is to be taught that cheap work in the pattern shop does not necessarily produce castings as cheaply as they ought to be made in the foundry.

A NEW FOUNDRY RIDDLE.

All molders are familiar with the disadvantages of the ordinary round riddle, which generally deposits a considerable percentage of the sand outside of the flask. To avoid this and other difficulties, the riddle shown in the accompanying illustration has been brought out by the Adams Co., of Dubuque, Ia. It is rectangular in form, thus localizing the riddled



sand to a greater extent. Inside of the ends of the riddle are provided a pair of clappers which jar the riddle and it is claimed greatly facilitate the work of riddling. The skilled molder will recognize at once that this is simply a case in which a mechanical device has been made to take the place of the rapping of the sides of the riddle with the palms of the hands.

It will also be noticed that there is a ridge formed in the netting across the middle of the riddle. This is to break up lumps and assist in keeping a clean screening surface. The riddle is made in one standard size, 11 by 18 inches, but can be furnished in any other size when desired, upon special order.

The first heat was taken off at the foundry of the Rock River Mfg. Co., Dixon, Ill., July 8. The plant starts under favorable conditions.

The Adrian Steel Casting Co., Adrian, Mich., has been incorporated with a capital of $30,000.

MOLDING MACHINE PRACTICE.

BY F. W. HALL.

The stripping plate method of mounting patterns on molding machines will frequently give good results where all other methods fail. The greatest objection to it is the great expense incurred in fitting up the necessary patterns and stripping plates. To illustrate this method I will take the internal gear shown in Fig. 1 and describe the fitting up of the patterns and stripping plates for making it. Where possible such a job as this would be mounted on a round molding machine, but we will assume that this is practically the only round job to be made in the foundry and that a square machine is already installed, hence it would be placed on this machine. The machine used for the illustrations is a 12 by 12 by 6-inch stripping machine of the Paxson Hall type. First, a blank ring for the pattern must be made, the casting being large enough to allow a finish all over. Care must be taken to see that a sound casting is secured. After turning the ring or blank to the proper size the teeth should be cut, and, as most shops are not equipped for cutting these internal gears, it will probably be necessary to send it to some

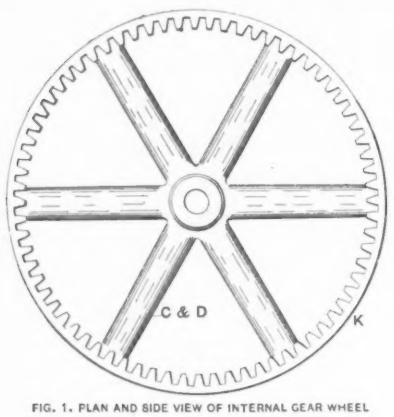


FIG. 1. PLAN AND SIDE VIEW OF INTERNAL GEAR WHEEL

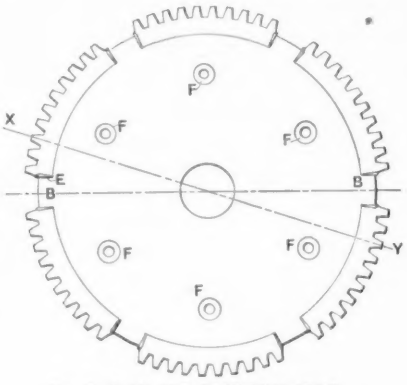


Fig. 2. PLAN AND SECTIONAL VIEW OF STOOL PLATE ON LINE X-Y

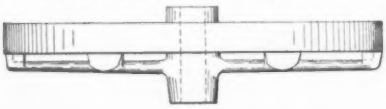


Fig. 6 PLAN OF STOOL

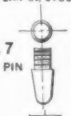


Fig. 7 FLASK PIN

Fig. 8 FLASK BUSHING

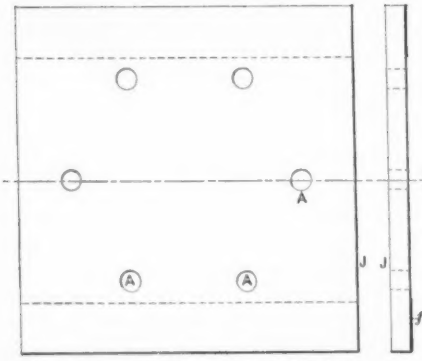


Fig. 3 PLAN OF STOOL PLATE SUPPORT

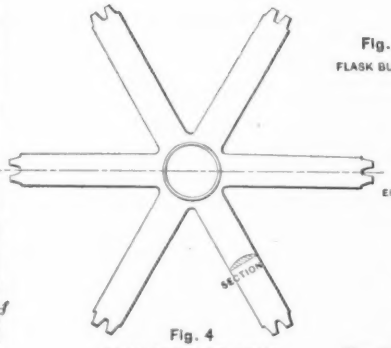


Fig. 4 PLAN VIEW OF ARMS

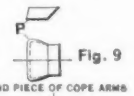


Fig. 9 END PIECE OF COPE ARMS

Fig. 10 PLAN OF SPRUE

Fig. 11 FEEDERS

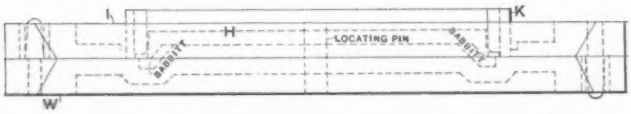


Fig. 5. VIEW OF PLATES AND PATTERN IN POSITION FOR BABBITTING.

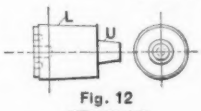


Fig. 12 VIEW OF HUB

regular gear works. For this reason it is well to make the ring first so that by the time the rest of the work is in shape the teeth will be cut and the ring returned from the gear works. The castings for the different parts should be made as shown in the detailed drawings, the proper allowance for finish being made. These castings should be pickled or sand blasted and then they will be ready for the machining and assembling. The drag stripping plate and the cope match plate should be taken first and the bottom surface of each planed off true. Next, the cope match plate should be taken to the lathe, clamped on the face plate, and a hole the size of the desired core drilled and bored through the center. This center hole will be used for locating the drag stool plate and the cope match plate, while doing the babbitting which is required later on. It will also be used to locate the parts. While the plate is secured in the lathe it should be faced off. In order to cheapen the wooden patternmaking on this job the casting for the drag stripping plate can be made from the pattern for the cope match plate. After this casting has been planed it is put on the face plate of the lathe and the center of the plate cut out so as to leave a hole having a diameter equal to that of the gear wheel. It is well to try the wheel in the hole before taking the plate from the lathe. While the plate is in the lathe it should also be faced to the required thickness. The plate should then be turned over, secured to the face plate again centered by the hole already bored, and the back turned out as indicated by the dotted lines in Fig. 14.

The stool plate, Fig. 2, should next be taken up. The pattern for this plate should have a finish allowed all over it. It should first be chucked and the bottom side faced true. The casting should be a circular blank from which the teeth can be filed or cut. After facing the bottom side, drill a hole in the center, of the same diameter as the core. The plate is then removed from the lathe, placed on a mandrel and returned to the lathe. The top side and outer diameter of the plate should then be turned to the proper dimensions. The outer diameter of the plate should be the same as the diameter at the bottoms of the teeth in the gear. The bevel surface on the top of the plate should begin 1-32 of an inch back of the edge of the teeth, so that the parting will not come directly at the points of the teeth. The six spaces B are for the drag arms to pass through. At the sides these spaces should be filled to the proper draft, as indicated at E. The stool plate must have six counter sunk holes drilled through it to fasten the stools. The stool plate should next be laid out for stripping the teeth of the gear. To accomplish this it is laid on the surface plate where it will not rock and the gear placed on top of it, care being taken to locate the gear true with the finished surface at the outer edge of the stool plate. The two should then be clamped together, care being taken to see that they do not move during the clamping, or if they do that they are adjusted by loosening the clamps and rapping them into proper position with a lead hammer. The outline of the teeth of the gear should then be scribed on to the stool plate. It is well to have the upper face of the stool plate coated with copper before the gear is placed on it so that the lines will show more plainly. This can be accomplished by cleaning the surface and then applying a solution of blue stone or copper sulphate. Before loosening the clamps, center punch marks should be placed on the gear and the stool plate so that they can be replaced in the same position in relation to each other. After the gear is removed the center of each space should be center punched and a hole drilled through to remove the major portion of the material between the teeth. This will leave but a small amount of material to be filed away. During the filing the stool plate can be supported on a mandrel held in a vise. After the filing is done the stool plate is to be tried in the gear. The gear pattern is usually made somewhat wider than the required casting and so a line can be scribed around it at a distance from the upper face equal to the width of the required tooth, plus the shrinkage. After this a slight draft or bevel can be filed on each of the teeth up to this line. Then the stool plate can be tried in the teeth and by using a coat of red lead marking, the places which bear hard can be determined and eased by filing until the stool plate will work freely clear through the gear wheel.

It is next necessary to fit up the gear wheel arms, as shown in Fig. 4, the cross section of the arm being shown. The arms for the drag portion of the mold should be fitted up first, on account of the fact that the end of each one of these arms acts as a stripper for two of the teeth of the gear. In order to reduce pattern expense one wooden pattern is made for both castings and the ends of the arms cut off for the portion which is used for making the cope half of the mold. The castings for the

arms should be 1-32 inch wider than required and a file finish should be allowed on all surfaces so that they can be smoothed up in good shape. Both halves of the arms should have a hole drilled through the center the size of the core print so that they can be located properly in relation to other parts. The arms shown in Fig. 4 can be lined up with the stool plate on account of the fact that each has a hole of the same size through them. The ends of the arms are then laid out and filed to fit the teeth of the gear. After the drag arms have been fitted they are clamped to the cope section of the arms and a hole about ⅛ inch in diameter is drilled in each arm clear through both patterns and a tight fitting pin driven in each. After this they can be placed in the vise and the cope section of the arm filed up in line with the drag section. In making a wooden pattern for the arms, a hub is used for one portion of the pattern and is removed while casting the other. The arms for the cope section, together with the hub attached to them, are shown at D in Fig. 17. It will be noticed that the arms in the cope section have pieces P projecting from the ends of the arms to the face of the rim, as shown in Fig. 1. These pieces are shown in detail in Fig. 9. Six of them are gotten out, filed up and secured to the cope match plate opposite the ends of the arms of the cope half of the pattern. To properly locate these a center line should be scribed across the cope match plate, and a circle scribed on the match plate equal in diameter to the outside of the gear wheel. The pieces P are then set on the cope match plate, even with the circle and secured in a proper position by screws.

Next it is necessary to babbitt the cope match plate. To do this the end pieces for the cope side of the arms are properly marked so that they can be returned and then removed from the cope match plate and a line of holes drilled around the match plate opposite the place where the babbitt is to go. The holes should be of such a size that a small nail can be driven into them as a driving fit. After this short nails or nails cut off near the heads are driven into the holes until the heads project about one-eighth of an inch. The parts are then assembled as shown in Fig. 5, the cope plate being laid down first and a locating pin placed in it center hole. The drag stool plate is next placed over the locating pin and re-

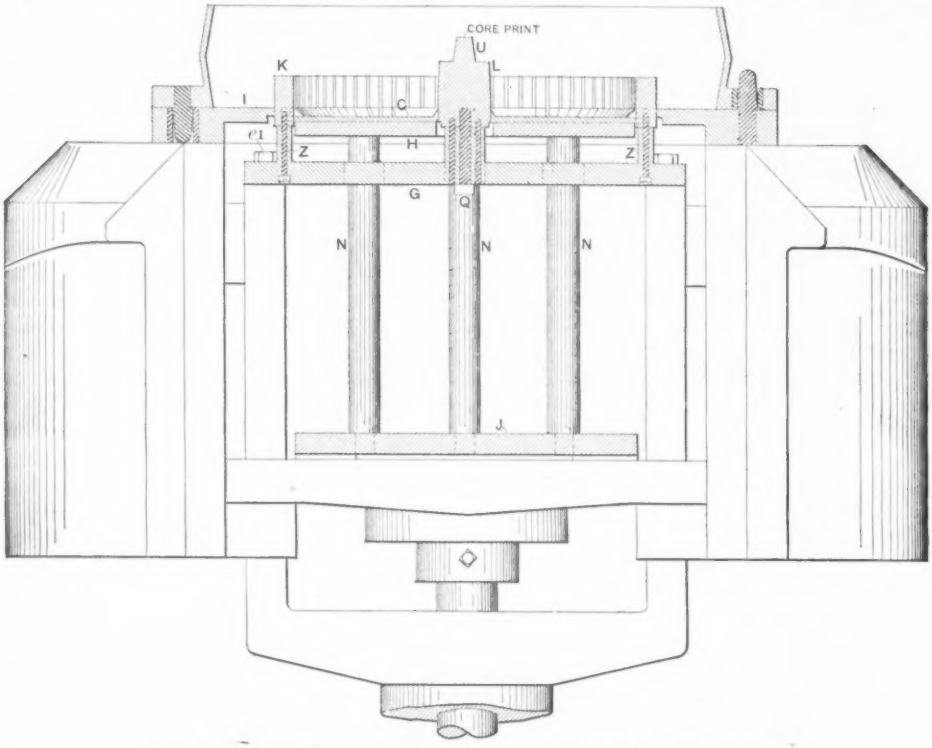


Fig. 13 MOULDING MACHINE OF PAXSON-HALL TYPE WITH SECTIONAL VIEW OF INTERNAL GEAR MOUNTED ON IT.

volved to the correct position. The gear is then set down around the stool plate, care being taken to place the same teeth in contact that were in contact during the fitting. This being accomplished by means of locating marks placed on each. The drag stripping plate is then set around the gear wheel with its top surface next to the top surface of the cope match plate. The two should be clamped together and five of the openings B in the stool plate, as shown in Fig. 2, should be closed with putty, so as to prevent the babbitt from running out. The sixth opening is to be used as a gate for pouring and hence a small pocket or a pouring basin should be built in front of it from putty or clay. Care should be taken to see that the ladle contains enough babbitt to fill the spaces at the pouring. After the babbitt nas set, holes for the flask pins should be drilled through the cope match plate and the surface of the babbitt and they should be placed together once more to see where the bearing spots come. Any high spots should be scraped until they come to perfect bearing, the babbitt filling the bevel space below the stool plate and being held in position by the nail heads. Before enlarging the holes in the match plate and stripping plate it is well to make the flask jig out of rough bar iron, using one of the plates as a jig for drilling the holes through the bar. After this one hole in each plate should be enlarged to receive the flask pin bushings, care being taken to see that the holes are so arranged that they will match properly when the plates come together. These holes can be enlarged by a counter bore having a tit of the diameter of the tap drill and a body of the diameter of outside of the bushings. The small holes in the plate should then be tapped to receive the threaded end of the flask

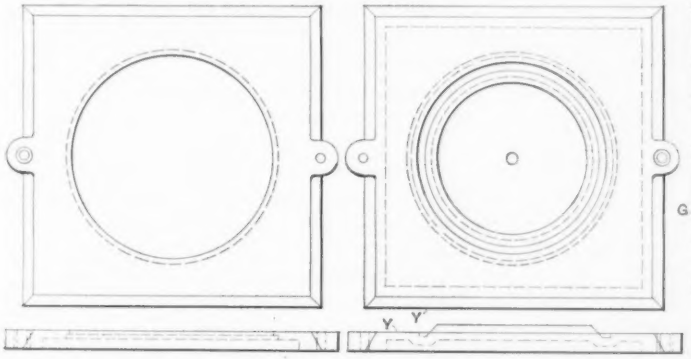


Fig. 14. PLAN AND SIDE ELEVATION OF DRAG STRIPPING PLATE.

Fig. 15. PLAN AND SIDE ELEVATION OF COPE MATCH PLATE.

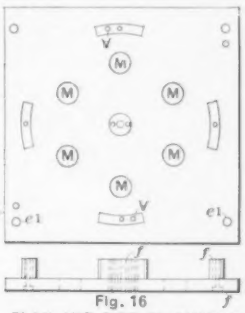


Fig. 16
PLAN AND SIDE ELEVATION OF PATTERN PLATE.

drag stripping plate. These holes should be laid off in line with the center lines or placed upon the plates. The spacing of the holes along the length of the plates should correspond to the size of the flask which is to be used. First, a hole of the proper size for the tap drill for the pins should be drilled through both plates.

The style of flask pin to be used is shown in Fig. 7 and the hardened bushings which are to be introduced into plates to receive the pins are shown in Fig. 8. Care should be taken now to mark both plates with a proper mark on the edge to show the position which they occupied when they were babbitted. They should then be taken apart and the gear wheel lifted off. The babbitt at the pouring gate should then be cut away with a cold chisel. In order to make sure that the plates have perfect bearings, some red lead should be placed over the pins and hardened bushings driven into large holes, as shown in Figs. 13 and 17. The flask jig must be counter bored still larger at each end to receive bushings, the internal diameters of which should correspond with the tap drill for the pins and with the outside diameter for the flask bushings. This jig is used for making the flasks interchangeable. In place of using a plain bar of iron to lay across the flasks, some prefer to use a plate with lugs for locating the flask properly. This jig is not shown in the illustrations.

After this it is necessary to locate the gear pattern K, Fig. 13, and the hub, Fig. 12. The pattern plate G is shown in plan and elevation in Fig. 16. The upright in the center of the plate is for supporting the hub and the four uprights surrounding it for supporting the gear pattern. The six holes M are made in the pattern plate to allow the six stools N, Fig. 13,

to pass through freely and hence these holes should be ⅛ inch larger in diameter than the body of the stools. The top and bottom faces of the pattern plate should then be finished. On the top face it is only necessary to finish the tops of the projecting uprights, which are indicated by finish marks in Fig. 16, but the base of the plate should be finished so as to give the proper bearings. The castings for the body of the hub, as shown in Fig. 12, should be taken and a hole drilled through the center of it to receive a pin the size of the core. A piece of machine steel should then be turned so as to form a driving fit in the hub and one end of this pin turned taper, as shown at U, Figs. 12 and 13. This end will form the core print. The arms C, Fig. 13, are then taken and a hole in the center bored out so that it will fit over the hub. The stool plate support J, Figs. 3 and 13, should be planed on both sides where

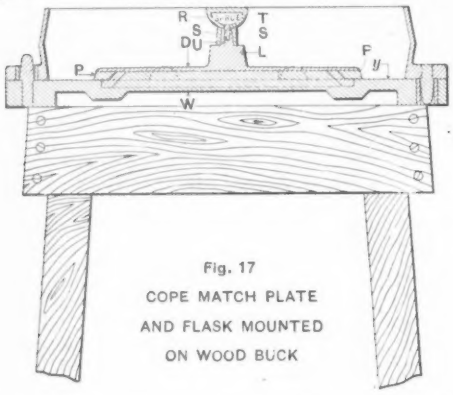


Fig. 17
COPE MATCH PLATE
AND FLASK MOUNTED
ON WOOD BUCK

the finish marks are shown. The six holes A, Fig. 3, should then be laid out by drawing a circle the proper distance from the center and arranging so that they will come opposite the clearance holes M in the pattern plate shown in Fig. 16.

The stools N Fig. 13, should be finished up as shown in detail in Fig. 6. When completed, the stool pins are screwed into the plate J, as shown in Fig. 13. This completes all the plates for the drag machine. The stool plate support J should then be set on the machine, as shown in Fig. 13, the pattern plate set in position and the gear wheel located on the pattern plate. Next, the stool plate should be slipped down through the teeth of the gear wheel until it rests on the stools N. The hub L should be slipped through the center hole in the arms until it rests on the center upright of the pattern plate G. Next set the stripping plate down around the gear wheel until it rests on top of the molding machine. Now, if all three plates J, G and I set right on the machine they should be stamped with a letter F on the front edge of each plate so that they can be replaced in the proper order at any time. The molding machine jig should now be taken and all necessary holes drilled in the plates J, G and I for screwing them to the machine. One of these molding machine jigs in sent out with each machine. The jig has "front" stamped on its front edge and "top" stamped on its upper surface, so as to make sure that it is applied to the plates in the proper position, as it is very easy to make a mistake in this matter. After the three plates are machined and doweled, take the pattern plate G, Fig. 16, and drill in two of the opposite uprights the dowel pin holes V. Then return the three plates to the machine and fasten them down with screws. A special center punch should be made to fit the dowel pin holes V. The gear should be set in place on the plate, being careful to see that the arms are in the correct position and with the special center punch in the holes V the gear wheel should be punched from the bottom. Holes should then be drilled in the gear to correspond with these dowel holes and two dowel pins introduced to locate the gear in its proper position. The upper surface of the stools should then be coated with red lead, the stool plate H set in its place on top of the stools and a light blow struck with a lead hammer directly over each stool end. The stool plate is then lifted out of the teeth of the gear and when turned over it will be seen that there are six red spots which were made by the red lead on the ends of the stools. A center punch mark should be made in the center of each of these and the holes drilled and countersunk from the top, as shown at F, Fig. 2. The red lead should then be wiped from the ends of the stools, the stool plate replaced in contact with the stools and a circle scribed on top of each stool by reaching through holes drilled in the stool plate. The stool plate should again be removed and a hole drilled and tapped in the end of each stool, as shown in upper part of Fig. 6. The gear K should be placed on the pattern plate G, locating it by the two dowel pins previously put in, and while it is in contact four holes should be drilled in the pattern for the four screws Z as shown in Fig. 13. The holes in the gear should be tapped and the screws introduced. The hub, with its steel core print driven in, should be located and the two dowel pins placed in the center upright of the pattern plate, as shown in Fig. 13. Between these a

screw should be introduced, as shown at Q, Fig. 13. The two dowel pins for the hub can be located by drilling holes through the support in the center of the pattern plate and marking the location on the hub by means of the special center punch. After the dowels have been introduced, the hub and pattern plate can be taken to the drill press and a hole for the screw drilled while the two parts are clamped together, the proper location being insured by the dowel pins.

The fitting up of the pattern plates for the drag is now complete and all that is necessary is to give the plates a coat of wax and black lead, or a coat of rust, and then smooth them with emery cloth and give them a coat of wax. Either one of these processes will make them work well in the sand. After treating the surface of the plates they should be assembled and secured in place, as shown in Fig. 13.

The arrangement for the cope match plate is shown in Fig. 17. As this is much more simple than the drag, it can be mounted on a wooden buck as shown. Of course it can be put on a machine if desired, but the buck is of much cheaper construction and will answer the purpose very well on account of the fact that there is no stripping plate necessary. In arranging this part a piece of steel should be taken and turned to the size of the core and one end of it tapered to form a core print as shown at U, Fig. 17. The four feeder pieces S, Fig. 17, and in detail in Fig. 11, are made of brass and fastened to the taper end of the pin by means of rivets. After this the pin U should be driven through the hub L, Fig. 17. The lower end of this pin is allowed to project and used for a locating pin for locating the patterns on the cope match plate as shown in detail in Fig. 15 and at W in Fig. 17, while the outer end of the pin with the feeders R projects and acts as a core print. The hub L and arms D of the pattern shown in Fig. 17 are in one piece and located centrally by means of a hole in the center of the plate W. The arms of the wheel for both cope and drag are located by means of center lines drawn on the cope and drag match plates, care being taken to see that the two patterns have the same arms opposite each other that they did when the two parts were finished and doweled together. The patterns are then secured to their respective plates by means of screws and as the pieces P have already been screwed to the plate W, Fig. 17, the arms will come in contact with them. This will complete the cope match plate. While the cope match plate is being fitted up a hole should be drilled in the center of the core print for securing the sprue and the top of the core print countersunk so that the circular face of the sprue will only bear on its outer edge. The sprue is located centrally by drilling a hole through the bottom of the sprue and into the top of the core print and introducing a dowel pin as shown in Fig. 17. The sprue is shown in detail in Fig. 10. The dowel pin should be made fast in the sprue and made a loose fit in the core print. It is also best to have a dowel pin hole drilled clear through the hub so that any dirt that collects in the hole will fall through. In order to make it possible to lift the sprue off easily when the mold is made it is made hollow on top and has a cross piece spanning it which acts as a handle, as shown in Fig. 10.

The next consideration is the flask and the style to be employed will depend upon the manner in which the sand is to be rammed. If it is to be rammed by hand the style of flask shown in the illustration will work well, but if it is to be rammed by power a flask with straight sides must be used, and it may be advisable to use a straight sided flask with ribs running diagonally across the sides, as in this case the ramming can be done either by hand or power.

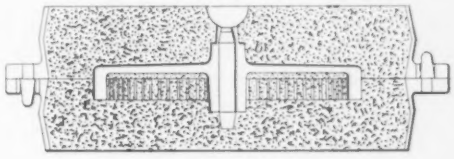


Fig. 18
CROSS SECTION OF
MOULD IN FLASK

After determining the style of flask to be used, a wooden pattern should be made for the same, the necessary castings made and pickled or sand blasted. The faces that come in contact should then be planed true and holes for the dowel pins drilled, with the aid of the flask jig. The hardened steel bushings and pins should be introduced into the proper holes, as shown in Figs. 13 and 17.

To make a mold with this rig, the following procedure is necessary: As the flasks are interchangeable any one of them can be taken and set in its place upon the drag machine shown in Fig. 13. The lever of the molding machine should be raised so as to bring the gear wheel pattern up through the stripping plate I. The sand should be sifted and shoveled in, rammed and struck off. It is only

necessary, of course, to sift in a thin coating of facing sand and fill the balance of the mold with heap sand. The molding machine handle should then be turned so as to lower the pattern down through the stripping plate. The drag half of the mold is then lifted off and set on the floor. The core having previously been made in an ordinary core box and dried, is set in position. To make the cope portion of the mold a flask is placed on the match plate, the sprue placed in position on top of the core print, the sand sifted and shoveled in and then rammed and struck off, the sprue removed and the mold vented. The flask with its contents is lifted from the cope match plate and set on top of the drag half, which has already been placed on the floor, with its core in position. A section of the completed mold is shown in Fig. 18.

TECHNICAL EDUCATION.

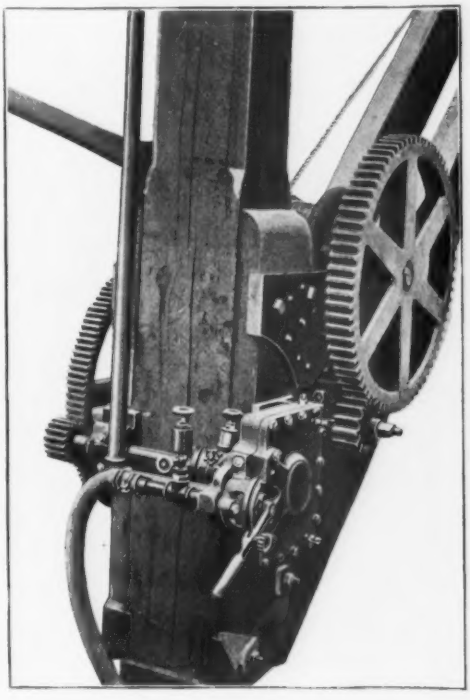
BY HARRY WILLIS.

I do not suppose in this advanced age it would be possible to find many practical men who would question the advantages of technical education. Although I have not until quite lately had the privilege of studying its effect upon the apprentices in the molding trade, owing to the fact that no class for technical instruction in the iron and brass molding trades have until lately existed in this country, I am nevertheless convinced that if thoroughly and systematicaly imparted, it must be of great assistance to not only those who are serving their apprenticeship, but also to many journeymen molders who have never had an opportunity of working on anything but specialty work. In addition to pattern makers, draughtsmen and engineers, I am quite sure there are many unfortunate molders who can testify to having been the victims of the want of practical knowledge, often illustrated by patterns being made in one piece which should have been made in halves, prints, bosses and flanges made fast, which should be loose, pads, pockets and drawbacks which could easily have been avoided by the substitution of a dry sand core. How few draughtsmen and engineers there are who have a thorough knowledge of proportion, contraction and shrinkage, and what disastrous results ensue from this want of knowledge, in the shape of broken arms in pulleys and spur wheels, ugly contraction cracks, twisted engine beds and frames, and all of which are caused from a want of knowledge of proportion. Many of the above enumerated effects are minimized, and in some cases obviated, by the foresight of the molder, who uncovers certain portions of his casting, loosening core irons, knocking out cores and in some cases turning his mold on edge. There are many other dodges the molder employs to try and defeat the natural effects which ensue from want of proportion. In many cases he succeeds, and in others he apparently succeeds, but the tension is there all the same, and it only requires a sudden shock or strain to make the casting fly apart, as has often been illustrated with serious and sometimes fatal results, when the machinery has been erected and working. If technical education can obviate or even minimize these results, the sooner our young pattern makers, draughtsmen and engineers take advantage of it, the better for all parties concerned in the manufacture of castings, and those who use them. There are many difficulties in the way of successfully operating a Foundry Trade School in the interests of apprentices actually engaged at the trade, particularly in small centers where there are very few foundries. The first and most important of these difficulties is to my mind the apathy of the apprentices themselves; it is urged by the apprentice that when he has worked all day in a molding shop, he does not feel disposed to put in another two hours in the evening, particularly as he is expected to pay for the instruction he receives in the evening, while he is paid by his employer for work done during the day. There is undoubtedly some force in this contention; but the fact remains, nevertheless, that if the apprentice has any ambition to fill a higher position in the trade than as an ordinary journeyman, two hours work in the evening once a week will not prevent him from attending a Foundry Trade School. Then again there are other boys for whom I have a considerable amount of sympathy, who, although they have plenty of ambition, and would be willing and anxious to take advantage of any opportunity to improve themselves, theoretically and practically, are prevented from doing so because all the money they can earn is required to keep the family in food and clothing. Now, it has often occurred to me that if the employers were alive to their own interests they would pay the necessary fee themselves, in cases where it could be proved the apprentice could not afford to pay it himself; indeed, I think he would find it to his advantage to pay the fee of any of his apprentices who might express a desire to attend a trade school. It is of course quite

obvious that any advancement in knowledge gained by the apprentice means better castings and more of them for the employer, and I am sure any apprentice whose fee was paid by his employer would feel himself under an obligation, and would consequently feel it his duty to persevere in his efforts to become as proficient as possible. Some twelve months ago a foundry trade school was established in this city, and the opinions expressed in this article have been formed from a close observation of the establishment and progress of this school. The school was established in one of the best jobbing foundries in the city, the use of the foundry, patterns and appliances being lent free of charge to the board of managers of the Technical Classes Association. The fee charged was ten shillings a term, instruction being given in all branches of the trade, including brass molding, and the only part omitted being the actual casting of the work molded. This is perhaps the greatest disadvantage, from the student's point of view; if the student had the satisfaction of seeing his work cast and comparing it with others, it would no doubt very materially increase his interest in the work. This want of finality is, undoubtedly, a very great disadvantage to successful instruction, and I must confess my inability to solve the problem. Under existing circumstances the foundry master who lends the foundry and appliances would not be allowed to take advantage of the free labor provided by the students, as it would be considered as unfair competition by the other foundry owners in the district, while the molders' union would put the machinery of the arbitration court in motion for employing labor at a lesser rate than the arbitration award to their disadvantage, while if the class managers were to make the castings and sell them, they also would be subject to the same restrictions. It is of course quite out of the question that the class managers could go on producing castings of all sorts and sizes, just for the satisfaction of seeing them made. The expenditure would be very great, and there would of course be no compensating return for the expense incurred. I trust that, even under the foregoing disadvantages, there will be sufficient enthusiasm among the apprentices in the various foundries to insure a good class at the foundry trade schools.

A CRANE MOTOR.

The problem of providing the ordinary jib crane with a power motor is one that has confronted a great many foundrymen. Such cranes are frequently used in the foundry yard, in the cleaning department, or in some place where they are not used continually, but at times have to be used a number of times a day and to handle relatively heavy loads. If operated by men in the old fashioned manner, this requires the services of several laborers, and is liable to seriously interfere with the work which these men would ordinarily be doing in other departments. Most modern foundries



A CRANE MOTOR.

are provided with compressed air, and recognizing this fact, the Holland Co., of Chicago, Ill., are applying the Dake compressed air motors to cranes in the manner shown in the accompanying illustration. All that is necessary to make the application shown is to remove the cranks and bolt the motor with its bearings to the mast of the derrick.

This motor can be used for other power purposes, as for instance, for operating the drum on the casting smasher, and, in fact, wherever a small power is required.

The Dix Foundry & Machine Co., of Glens Falls, N. Y., has been organized to operate the plant of the J. L. Dix Foundry Co., which was established sixty years ago by J. L. Dix.

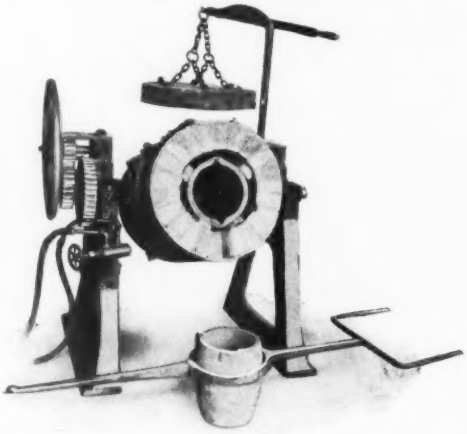
THE STEEL-HARVEY MELTING FURNACE.

The modern tendency in the melting of alloys is to study the fuel problem, speed of melting and other factors much more closely than in the past. This study has resulted in the bringing out of many new melting furnaces. One of the latest furnaces, and one which has many points to commend it, is the Steel-Harvey furnace shown in the accompanying illustrations. It consists of a metal casing lined with firebrick and mounted upon suitable trunnions. Within this firebrick casing is supported a large crucible. Oil or gas can be used for melting and is introduced through the side of the furnace by a suitable burner and mixer. The lower part of the furnace serves as combustion chamber and the hot gases rise around the walls of the crucible. The top of the furnace is covered with a removable cover, having an opening in the center for the escape of the gases. The

STEEL-HARVEY MELTING FURNACE.

cover can be lifted off by means of suitable chains and a small lever operated crane, as shown in the illustration.

Some advantages possessed by this furnace are as follows: In the case of an ordinary pot furnace in which the crucibles are heated and subsequently lifted for pouring, the crucibles are subject to very sudden and extreme changes of temperature, which tend greatly to reduce the life of the crucible. In this furnace the crucible, after the metal has been poured out, is still surrounded by the heated walls of the furnace, and hence sudden changes are to a large extent avoided. In most of the oil melting furnaces the products of combustion have more or less of a blow pipe action on the surface of the metal, which in many cases results in the oxidation or volatilization of a considerable portion of the more volatile



STEEL-HARVEY MELTING FURNACE.

or easily oxidized metals in the alloy. The use of the crucible in this furnace enables the melter to use a cover of charcoal, salt or any other desired material and thus protect the surface of his metal from the action of the fuel during the melting, and then, too, the form of the furnace is such as to protect the metal. The makers claim that with a furnace using a No. 40 crucible it is possible to take off twenty heats per day, thus obtaining 2,400 pounds of metal, and that with a No. 125 crucible nine heats per day can be taken off, obtaining 3,200 pounds of metal. The capacities of the other sizes of furnaces are proportionate.

DETERMINING THE WEIGHT OF CASTINGS.

BY C. M. SCHWERIN.

The instrument known as the Polar Planimeter was invented by Professor Andler in 1856, and is used to determine areas of irregular flat surfaces. As shown in Fig. I. it consists essentially of three parts, the carriage revolving on measuring wheel D, the pole arm, to which is affixed the pole E, and the tracing arm, which carries the tracing point F. M is a screw adjustment for accurately setting the carriage which slides along the tracer arm. G is a recording dial, connected by the worm

on the carriage with the measuring wheel D, which records the number of complete revolutions made by the wheel.

The area of any plane figure, no matter how irregular in outline, may be obtained by pressing the point of pole E into the paper and then tracing the outline of the figure with the tracer point F. The complete outline must be gone around, and the tracer must return to the point from which it started. The wheel D will show the area.

The instrument can be set so as to read in square inches, square millimeters or fractions of any unit. All area instruments are made in various sizes, but the one with the 12″ radius is the one most convenient for ordinary use.

The above instrument has been satisfactorily used for obtaining areas from maps drawn to scale and for obtaining area of indicator diagrams in making engine tests.

A particular use to which the foundrymen may put it, is to obtain the weight of a casting from the drawing of the pattern or of the casting itself, when the casting cannot be divided into regular geometric figures.

The following is an example of the calculation for two car wheel patterns. A car wheel pattern presents almost as complex a problem as it would be possible to have, so that the general idea here brought out could be modified to meet any class of work.

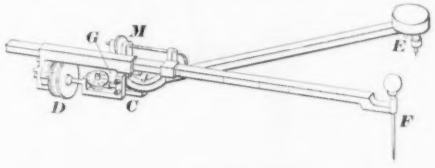


FIG. 1.

The object of this graphic method is to estimate the weight of the casting, which is to be made from a given pattern, when the cross-section is not a uniform geometrical figure. Such an estimate is a very important guide to the foundryman, who would otherwise guess at the probable weight of a casting of new design, and, in trying to be on the safe side, would probably melt an unnecessary amount of iron. It is also an aid to the designer of a new car-wheel pattern, who must otherwise from general experience determine the probable weight, have test wheels made, and correct the pattern afterwards, so as to obtain the weight prescribed.

For the method here described, an accurate drawing of the pattern is employed. This gives a closer result than a drawing of a wheel itself, for the following reasons:

1. Calculations based upon the actual dimensions of the wheel involve the erroneous assumption that the specific gravity of the casting is uniform throughout; and upon that basis the calculated weight would be wrong, because the amount of metal poured has shrunk in the mold, acquiring the highest density in the outside chilled portion, and growing less dense through the mottled to the gray portions.

2. Calculations based upon the dimensions

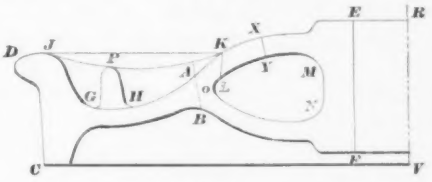


FIG. 2.

of the pattern or "chiller" assume that the cooled metal will not have shrunk, but will have the volume of the pattern and a uniform density.

These assumptions, though erroneous, counterbalance each other. For instance, the pattern and the chiller, which will give a wheel of 33″ diameter when cold, are respectively 33.5″ in diameter. This shows a shrinkage for wheel iron of about 3-16 in. per ft. (Ordinary gray iron is commonly assumed to shrink ⅛ in.) Wheels cast in 33.5″ chillers do not always have the same diameter. They may vary ⅛ in. either way by reason of differences in composition, pouring temperature, duration of pouring, and probably also slight variations in cooling. But the average diameter is 33 in.; and it is found that a calculation based upon the 33.5 pattern, and the assumed uniform density of 0.26 lb. per cub. in. of molten wheel iron, as it fills the mold, gives correct weights of the wheels, even though the latter vary in size as before explained.

For a casting of uniform specific gravity either the drawing of the casting, or that of the pattern, could be used. If the latter, then a percentage for shrinkage must be subtracted.

Fig. 2 shows, in reduced size, half the cross-section of the pattern of an ordinary cast-iron car wheel.

From the full sized drawing, divided by the line A, B, as shown in the figure, the areas A, B, C, D and E, F, B, A are taken with the planimeter, and the areas L, M, N similarly determined are subtracted from their sum. The

remainder is the area of the half-section of the pattern, exclusive of the brackets. Let this area (in sq. in.) be called A. The reason for dividing the drawing by the line A, B is because the planimeter was not large enough to measure the whole area.

A blue print is then made, pasted on cardboard, cut out along the lines D, E, F, C, D and L, M, N, L, and then balanced on a pinpoint, to determine the center of gravity of the irregular figure. This point (O in Fig. 2) is located on the tracing, and its distance from the center line of the wheel-axis, R, V, is measured. Let this distance (in inches) be R. If w = 0.26 lb. be taken as the weight of the metal per cub. in., and W. as the weight of the wheel, then $W = 2 \times 3.1416 \times R \times R \times w$ + weight of brackets and letters, minus weight of metal displaced by the core-legs of the pan-core. The constant 3.1416 is the ratio of the diameter of a circle to its circumference.

The following calculation for two wheels is given as an example:

The calculation for $2 \times 3.1416 \times R \times A \times w$ was as follows:

	No. 1.	No. 2.
Area of E. F. C. D	52.38 sq. in.	53.17 sq. in.
Area, L. M. N	12.42 sq. in.	9.60 sq. in.
Net area (A)	39.96 sq. in.	43.57 sq. in.
R	9.38 in.	9.25 in.
Cubic contents of pattern	2353.6 cu. in	2531 cub.in.
Weight (cub. cont. x 0.26)	611.95 lbs.	658 lbs.

The requisite addition for weight of brackets is approximately calculated as follows:

	No. 1.	No. 2.
Area G. P. H	2.24 sq. in.	2.30 sq. in.
Assumed average, ½ G. P. H	1.12 sq. in.	1.15 sq. in.
Ave. length measured on curve	10.5 in.	10.25 in.
Volume of one bracket	11.8 cub. in.	11.8 cub. in.
Weight (vol. x 0.26)	3.06 lbs.	3.06 lbs.
Weight of 13 brackets	39.78 lbs.	
Weight of 15 brackets		45 9 lbs.

NOTE: The 650-lb. wheels have 13, and the 700-lb. wheels 15 brackets.

The weights of the letters was obtained by weighing the same letters cast in lead, and taking seven-tenths of the result as correct for iron. This gave, for each wheel, 1.2 lbs.

The amount to be subtracted for the metal displaced by the core-legs was calculated as follows:

	No. 1.	No. 2.
Thickness (x y) of bottom plate	$\frac{7}{8}\frac{9}{2}$ in.	$1\frac{3}{8}\frac{3}{2}$ in.
Approx. av. diam. of core legs	$2\frac{5}{6}$ in.	$2\frac{5}{8}$ in.
Area of base of equiv. cylinder	4.4 sq. in.	5.9 sq. in.
Volume of equiv. cylinder	4 cb. in.	6.5 cub. in.
Weight (x 0.26) for one core leg	1 lb.	1.7 lbs.

The final net weight for each wheel was determined as follows:

No. 1. . . . 611.95 + 39.78 + 1.2 − 3 = 649.93 lbs.
No. 2. . . . 658 + 45.9 + 1.2 − 5.1 = 700.00 lbs.

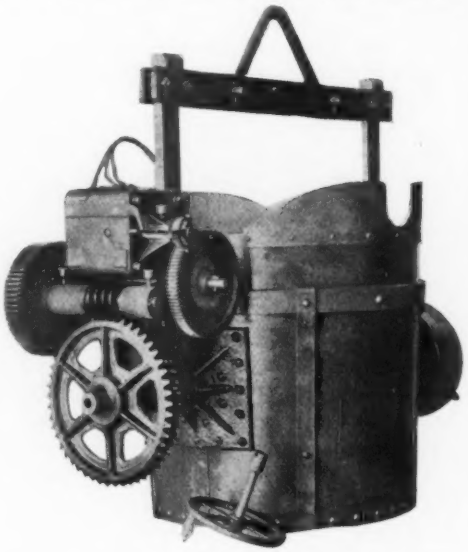
The calculation for No. 1 was made from the pattern-drawing for a 650-lb. wheel; that from No. 2 from the pattern drawing for a 700-lb. wheel. The cleaned wheels made from these patterns are averaging 655 and from 700 to 705 lbs., respectively.

Since a variation of 2 per cent. above or below the regular weight can be easily caused by variable molding in the making of a car wheel, it will be seen that the foregoing method of calculation gives reliable results. For castings of soft iron, and of more regular shape than car wheels, results could be more easily obtained.

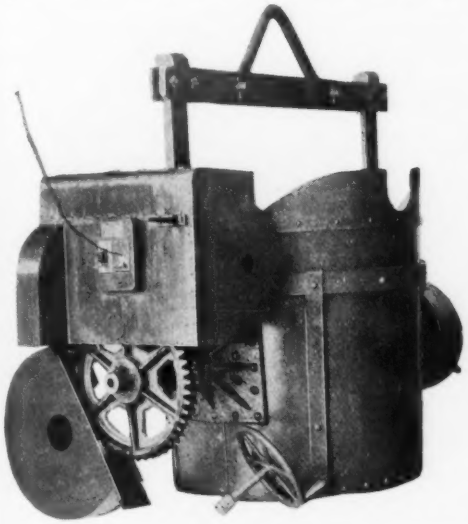
The Planimeter is an example of an essentially practical instrument based upon principles of the higher mathematics, and, while the operation of the instrument is remarkably simple, it requires the reasoning of the calculus to demonstrate the mathematical proof of its good work.

AN ELECTRICALLY OPERATED FOUNDRY LADLE.

While great advancement has been made in many points of foundry practice, and especially in foundry equipment, some parts of the equipment have not been improved as rapidly as one might expect. Copper smelters in steel works have been controlling the pouring crane ladles without the use of the ordinary hand operated gearing, this being accomplished by means of a chain and the auxiliary hoist. In such a case as this the operator in the crane cab



was in entire control of the pouring operations. Recognizing the advantage of a system by which the ladle could be controlled by some one who was not exposed to the intense heat of the pouring operation and who had it under instant and thorough control, Byram & Co., of Detroit, Mich., have recently brought out a foundry ladle which is an improvement on any that we have thus far seen. The ordinary pouring or controlling mechanism is supplemented by an electric motor controlled by the man



who operates the crane. By this device he is able to locate his ladle properly and then pour it. The two accompanying half tones show the device in one case with the upper portion of the motor cap in position, and in the other case with the operating mechanism exposed. As an auxiliary means for operating the pouring arrangement a hand wheel is provided which can be applied to the end of the motor shaft. The ladle shown was of about 8,000 pounds capacity. The gears are all machine cut, and the parts so arranged that the action is sure and the pouring smooth and uniform.

SLAGGING A CUPOLA.

BY JOHN DOYLE.

I have noticed the discussion which has been going on in *The Foundry* as to the amount of limestone to be used and as to its position in the cupola, with considerable interest. I see that Mr. Keep says that no limestone is needed on the bed charge, while Mr. Shedd states that it is. It looks to me as though Mr. Shedd had lost sight of one thing in this matter, and that is the fact that while the bed charge is an incandescent mass of fuel all through the melting operations that it is also a solid mass of unburned coke, the structure of which must remain strong enough to hold the burden well above the tuyeres and keep the iron at the melting point until it is thoroughly fused. In other words, as long as melting is in progress, the ash contained in an amount of fuel equal to the bed is locked up in such a way that it cannot possibly enter the slag, hence the ash in this amount of fuel can have no bearing whatever on the slagging problem. As a consequence, the only material in the cupola to be slagged is the ash in the succeeding charges of coke and the sand or iron oxide adhering to the metal charged.

We know that it is some minutes before any amount of slag accumulates in the cupola and that it is also some time before the first and second charges of coke are entirely consumed or are united with the bed by the melting out of the iron between them. Hence, it seems that in this case, as in many others, practice has found the best solution of the problem, which is to begin adding the fluxing material with some charge varying from the third to the fifth.

If the iron is very dirty it might be well to have some limestone or fluor spar on the bed charge, or on the first charge above it to take care of this dirt, but with relatively clean metal only a small amount would be required, and in practice it is probable that the introduction of limestone with the fourth or fifth charge would be all that would be required. The introduction of the limestone too early will simply give the lime in the burden as another factor to absorb heat at this point. The coke must be consumed before its ash can enter the slag and the iron melted away from the dirt associated with it before the latter can enter the slag. It is probable that in practice the limestone first unites with a small amount of the siliceous matter, forming a thick slag. As more silica is picked up, the slag becomes exceedingly fluid and in settling through the charge, takes up any silica in the upper part of the bed, so that by the time it reaches the slag hole it is less fluid than it was at the melting point.

D. J. Renaud, who for several years has been operating a brass foundry at Carthage, N. Y., has purchased a plant at Deer River, N. Y., for the manufacture of plows, and will remove it to Carthage.

CAST IRON NOTES.

Devoted to inquiries from Practical Foundrymen on the subject of Melting and Using Cast Iron. Address all inquiries to W. J. KEEP, care of The Foundry.

Good Brass Castings.

Question. How can we make brass castings with a good, clean skin? We have exceedingly good sand and roll it in a mill; we have tried plumbago, various powders, flour, etc., but we cannot get the smooth skin that we have seen on sample castings supplied to us.

Answer. Use about three-quarters of fine brass molding sand which has been used and one-quarter of very dry and fine red sand. This should be thoroughly mixed with about one handful of flour to each bushel of the mixture, and use syrup water or molasses water for wetting down. Use either charcoal or lacopodium for facing.

Or, instead of preparing the sand heap, sift flour on the mold, then blow it off and then sift lacopodium and blow it off. Never print the pattern back.

Stove Plate Scrap as a Softener.

Question. Is it practicable to use stove plate scrap with gray forge pig which carries about 1.30 per cent. silicon to make a casting with from 1.60 to 1.90 per cent. silicon? Is it practical to add stove plate scrap to No. 2 pig which carries about 2.50 per cent. silicon to make a casting with 2.80 to 2.90 per cent. silicon? Is there any accepted analysis for stove plate scrap?

Answer. The average silicon in old stove plate is about 2.75 per cent, therefore it is practicable to make the first mixture, but not the second. The grain of stove plate is so close and the sulphur so high that it will close the grain of castings, but will not soften them. The silicon in stove plate scrap does not soften as if it were in the pig iron.

Iron for a Drop Weight.

Question. Would steel with 1-10 of 1 percent carbon make a good drop weight? How can I make a 1-10 carbon steel?

Answer. It would be altogether too soft. Ordinary gray iron with enough spiegel added to make manganese from 3 to 6 per cent. will make a very tough and hard weight. The only practical way to make mild steel is by some of the types of Bessemer converters or in an open hearth furnace. This is not an air furnace which is used for melting iron without materially changing the carbon.

Annealing Gray Iron Castings.

Question. Please describe the method of annealing gray iron castings. One foundry that we have heard of uses most any kind of scrap, but by annealing renders their castings soft and strong enough for any machine work.

Answer. You will be obliged to build a brick oven. Pack the castings in iron boxes with some material that will keep the castings straight. Some use parting sand and some use wood shavings. When packed and the cover is on and luted with clay, pack in the oven so that the flame can heat the boxes. A casting placed loose in the oven will anneal as well. Heat the castings to a white heat, or at least above a cherry red, which will take about 12 hours. It is usual to keep the heat up for about 12 hours, but this is not necessary. Let the castings cool slowly, which will take about 12 hours more. If you use the wood chips for packing the resulting charcoal can be used over and over again.

Chilling Irons for Plows and Grinders.

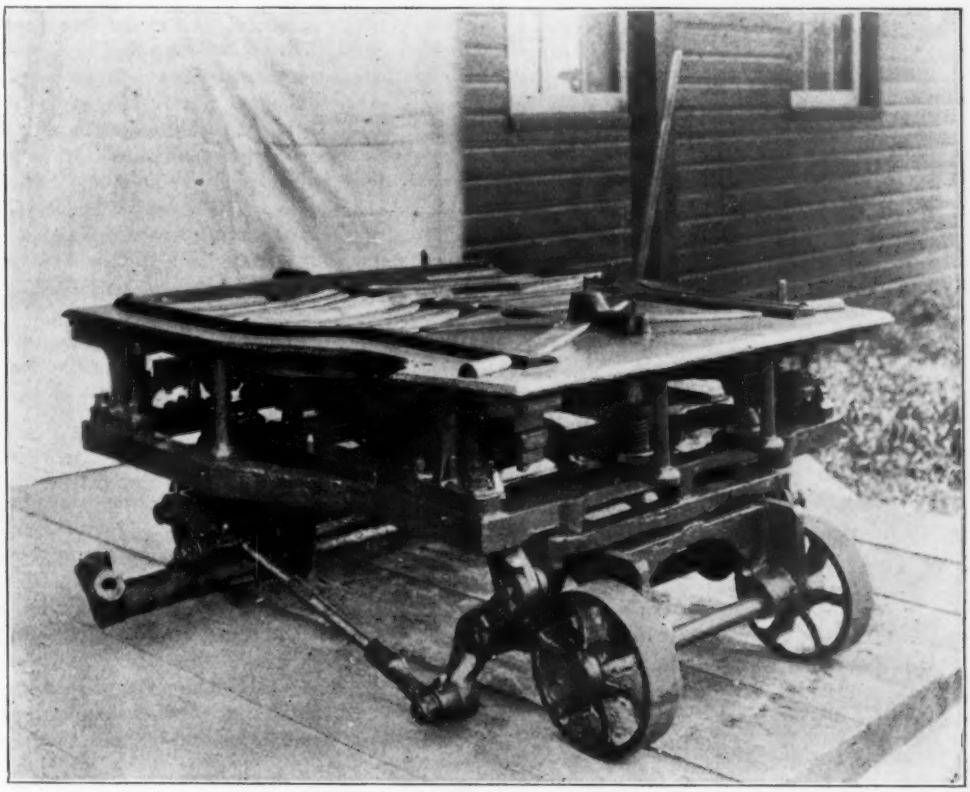
Two questions are for the same thing. One for chilling mixture for grinding mills and one for chilled mold boards.

Answer. There would be no trouble if it was understood that some white iron and some low silicon irons will not take chill. Even some low silicon charcoal irons will not take chill. Be sure that the irons purchased are chilling irons. A good way to make a chilling mixture is to use old car wheel scrap or other chilled iron and soften with irons higher in silicon, but that are still capable of taking a chill.

All About Cast Iron.

Question. I am a new subscriber to your valuable book and hope you will answer the following seventeen questions in your next issue: First, what are the proportions of pig iron? Second, what effect has the silicon on the iron? and so on. We would advise sending $2.50 to this office for a copy of the book "Cast Iron," or $3.00 for "Metallurgy of Cast Iron." We notice the term used "for a fair grade of iron." What would be the best for heavy ma-

chinery would be worthless for chill rolls and another composition might be good for stove plate, but absolutely unfit for machinery. Every iron is the best possible for some use and unfit for others, but it is impossible to give the extreme of carbon, silicon, etc., in a fair grade of iron. As to the percentage of ash and sulphur in coke, from 8 to 10 per cent. of ash is needed to give the coke strength. Sulphur should not exceed 90 per cent. and it will readily go below 60 per cent. About 75 per cent is good.



A NEW MOLDING MACHINE.

A NEW MOLDING MACHINE.

It is to a large extent true that necessity is the mother of invention and that our necessities cause us to develop devices for doing our work for us. The necessity for the production of their own castings in a better manner and in such a way that they would be absolute duplicates, has caused the engineers connected with the Oregon Foundry & Machine Co., Oregon, Ill., to develop a number of very interesting and useful molding machines, one of which is shown in the accompanying illustration. This is used for molding heater sections, and, as shown, the pattern for one side of the heater section is mounted upon the stripping plate. Some of the advantages of this machine are that it is provided with four guides, which hold the pattern always in its proper position, and thus prevent the possibility of ramming it out of true. The machine is so made that the parts can be set true to the 1-1000 part of an inch and will remain as set. The parts of the machine are also so arranged that all the wearing parts are protected to an unusual degree and the lower portion of the machine is open and free for the introduction of stools when needed. They also make machines of the same general style, both for large and small work.

The Delphos Foundry Co., of Delphos, O., are erecting a new foundry 60x220 feet.

ASSOCIATIONS AND SOCIETIES.

New England Foundrymen's Association.

FRED F. STOCKWELL, SECRETARY, CARE OF BARBOUR-STOCKWELL CO., CAMBRIDGEPORT, MASS.

The July meeting of the New England Foundrymen's Association was held in the way of an outing at the Point Shirley Club, Winthrop, Mass. It was voted that all business be dispensed with. The president reported the death of Mr. A. J. Miller, Sr., of Providence, R. I. A committee on resolutions consisting of H. A. Carpenter, J. O. Henshaw and Theodore Colvin, was appointed.

Announcement was made that the August meeting would be held at Providence and arrangements for it will be made by the Providence members, Mr. H. A. Carpenter acting as chairman. The meeting closed with 56 present.

THE PHILADELPHIA FOUNDRYMEN'S ASSOCIATION.
Howard Evans, Secretary, care J. W. Paxson Co.

PITTSBURG FOUNDRYMEN'S ASSOCIATION.
F. H. Zimmers, Secretary, care Union Foundry & Machine Co.

THE ASSOCIATED FOUNDRY FOREMEN.
Frank C. Everitt, Secretary, 2413 Third Ave., New York, N. Y., care The J. L. Mott Iron Works.

ERIE FOUNDRY FOREMEN.
W. F. Gruman, Dist. Vice Pres., care Erie City Iron Works.

MILWAUKEE FOUNDRY FOREMEN.
Thos. Glasscock, Dist. Vice Pres., care Pawling & Harnischfeger Co.

CHICAGO FOUNDRY FOREMEN.
David Spence, Dist. Vice Pres., 142 Bunker St.

NEW YORK FOUNDRY FOREMEN.
S. M. Williams, Dist. Vice Pres., 221 Third St., Elizabethport, N. J.

INDIANAPOLIS FOUNDRY FOREMEN.
W. H. Holmes, Dist. Vice Pres., care American Foundry Co.

MEETING OF THE AMERICAN SOCIETY FOR TESTING MATERIALS.

The seventh annual meeting of the American Society for Testing Materials was held at Atlantic City, June 16th, 17th and 18th. This meeting was very well attended, and a number of the papers and matters considered are of special interest to foundrymen. One point of interest is the remarkable growth of this society. The membership during the past year has been increased from 349 to 500 and in two years has been increased nearly 200 percent. The dues of the society have been $3.00 per year, but on account of the expense of getting out their fine volume of transactions every year, together with other necessary expenses, it was found necessary to increase the dues from $3.00 to $5.00 per year.

At the first session the subject of coatings to preserve iron and steel was brought up and the committee appointed to consider this question reported. The reports consisted simply in the individual statements of the different members of the committee printed in pamphlet form. While the report deals largely with the protection of structural material, it seems as though those interested in the foundry end of the problem should see that before the matter is dropped the protection of cast iron should be taken up. Dr. Dudley and Mr. Sabin were the principal speakers in the discussion which took place.

The method of testing paints which was reported as in common use was to paint the surface with dextrine and then paint it with the material to be tested. This was then immersed in water, and if the paint was porous water would pass through it, dissolve the dextrine, and cause the paint to peel off from the surface.

At the second session, Thursday evening, Dr. Chas. D. Dudley made the annual address, having for his subject "The Influence of Specifications on Commercial Products." The address dealt mainly with metals other than those produced or handled in the foundry.

The session of most interest to foundrymen was the third session, which was held on Friday morning. Two separate sections met at this time, one to discuss cast iron and the other cement.

The report of Committee B on standard specifications for cast iron and finished castings was presented by the chairman, Walter Wood. The standard specifications proposed and reported on by the committee included those for foundry iron, pipe and special castings, locomotive cylinders, car wheels, malleable castings and gray iron castings. In submitting his report, the chairman said:

"In laying before the meeting the results of the sub-committees in the form of the proposed standard specifications for cast iron and finished castings, there is little to add, except to call attention to the fact that care was taken in forming these sub-committees to appoint

on them men prominent in each specialty covered by these specifications. Each committee in doing its work followed the same general plan, namely, to discuss among themselves, either at a personal meeting or by correspondence, the general form, details and features of the specifications. As each specification was completed the final result was referred as a whole to each member of the committee, and the result reached was as nearly unanimous as could be expected where men of strong individuality compare and adjust differences of views. It is hoped that the committees which have as yet not been able to report, namely, those on 'Influence of the Addition of Special Metals to Cast Iron,' and 'Micro-Structure of Cast Iron,' will, as time goes on, be able to lay before the society interesting facts on these two important subjects, which really lie at the foundation of the intelligent study of the physics of cast iron, and this, after all, is the basis upon which practical results must rest.

"The International Association expecting to meet in St. Petersburg in August of this year, the president requested that all matters to be brought before that congress should be in his hands by Jan. 15. Copies of the specifications now before you were therefore duly forwarded to President Tetmajer. It is hoped that the postponement of the congress on account of the war will permit a full discussion of these specifications by our foreign associates, so that when the next congress meets, it will be possible to reach some definite conclusion as to international specifications.

"The drafting of standard specifications naturally brings into harmony various thoughts and suggestions, all of which are good and lead to practical results, and which probably only need to be reduced to a system for the sake of reaching the desirable end, viz.:—a uniformity of methods. In addition to this general purpose, the committees have had in mind two most important points: 1. To establish an intelligent standard for the purchase and sale of pig iron, and thus to abandon the old-fashioned way of grading the metal from its appearance. 2. To adopt a standard test-bar, and to fix the manner in which it shall be made and tested. The committee has furnished a measure to which the test-bars now in use throughout the various trades can be referred.

"If nothing further had been accomplished, the work of the committees would have been most useful. They have gone further, however, and have covered quite thoroughly the whole field of cast iron and finished castings."

Foundry Iron Specifications.

All of the proposed standard specifications have been previously published in these columns and only the discussion will be touched upon. In considering the foundry pig iron specifications it was agreed that the penalty of 1 percent was entirely too low, and it was suggested, in accordance with the action of the American Foundrymen's Association at its recent convention in Indianapolis, that this be increased to 4 percent, the buyer retaining the right to keep or reject the iron. In making this suggestion it was stated that without this option a small foundry desiring a quantity of iron of a certain grade, if it did not conform to the specifications, would be compelled to take in an iron of an entirely different quality from that desired, and for which no immediate use would probably be found. In the case of large foundries, on the other hand, this rejection clause is not so necessary, as such iron can always be used, but for the protection of the small founder this option was suggested for insertion.

The question of castings showing an increased sulphur content over that contained in the pig iron was brought up. Dr. Dudley stated that much iron is spoiled on the molding floor. Sand castings show this increase owing to the sulphur in the coke which all practically reappears in the casting, and as the very best grades of coke contain as high as .75 percent of sulphur the increase in the sulphur in the casting over that contained in the iron can be readily explained. Owing to the high sulphur content in coke, it was formerly and is yet to some extent the practice to use anthracite coal for fuel. Dr. Dudley was asked whether this sulphur could not be kept down by the use of an air furnace, and he explained that it could, but that the process was four to five times as costly as the cupola method of melting.

Mr. Kinkead—By the use of manganese the sulphur in the iron can be greatly reduced, the manganese being used in the pulverized form and put into the ladle, or a manganese iron could be used. Furthermore, by melting iron fast and not permitting it to be in contact with the coke too long the sulphur can also be kept down.

Dr. Moldenke said that in some European foundries an oxide of manganese is used for this purpose with a basic flux, and as a result the sulphur is greatly reduced. Dr. Dudley stated that the sulphur limits for foundry iron specifications are without a doubt difficult to

limit, owing to the fact that many excellent castings contain high percentages of sulphur. However, he added that these specifications were just something to begin on and that they can be changed from time to time. The specifications, together with the suggestions, were referred back to the committee for modification, after which they are to be referred to the executive committee.

The specifications for cast iron pipe and special castings were adopted, while the proposed specifications for locomotive cylinders were referred back to the committee.

Car Wheel Specifications.

The proposed special specifications for cast iron car wheels precipitated a lively discussion. Mr. Sherman suggested that the weights of wheels be limited to three classes, as follows: Six hundred-pound wheel for cars 60,000 pounds capacity and less; 650-pound wheel for 80,000 pound car, and 700-pound wheel for 100,000 pound car. The present classification gives wheels of 590, 650 and 705 pounds for 60,000, 70,000 and 100,000 pound cars. Dr. Dudley says that he places the greatest importance on the tape sizes of the wheels, inasmuch as the smaller the tape size the deeper the chill, while the larger the tape size, the smaller the chill and the more liable the wheel is able to withstand the tests. Mr. Sherman stated that the specifications state that the wheels should be selected for testing at random, while the inspectors usually take the extremes of the tape sizes for their tests. Limiting the tape sizes to three he said was hardly fair, inasmuch as they oftentimes run up to four and five. Dr. Dudley continued the discussion, saying that the railroads cannot take chances on car wheels and will not do so. With the heavy equipment now in use, the question arises whether the cast iron wheel will continue to answer the purpose. He said that he believed it would with certain modifications. With reference to tape sizes, he said that it is assumed that the wheels of the same tape size are all of one quality, and if a wheel fails, it is fair to assume that all the other wheels of the same tape size in the lot offered will fail.

The question of the drop test and the number of blows to be delivered was next taken up, and it was suggested that the weight of the drop be increased, the drop for the 600-pound wheel to weight 140 pounds; 650-pound wheel, 175-pound drop, and the 700-pound wheel to have a 200-pound drop. With regard to the thermal test, it was suggested that for the 600-pound wheel the limits are to be 2 minutes, for 650-pound 2½ minutes, and for the 700-pound wheel 3 minutes. On the question of annealing it was stated that reannealed wheels withstand the thermal test better than wheels only annealed once. With reference to the annealing of wheels it was stated that the top wheel does not stand as good tests as those further down in the pit. Mr. Sherman said that he has overcome this difficulty to a large extent by having a cast iron cover on his pit, and covering it with hot sand to a depth of about six inches. The specifications with the suggestions were referred back to the committee for further action.

In the specifications for malleable castings it was suggested that the tensile strength be reduced to 40,000 pounds, and the speed of testing was criticised in the gray iron specifications. Both were referred back to the committee.

The balance of the discussions, while of great interest to many, were of problems concerning iron and steel, forgings, testing, and other subjects not of special interest to foundrymen.

FOUNDRY EXHIBITS AT ST. LOUIS.

The work on the foundry exhibit at St. Louis has been progressing rapidly this month. The Whiting Foundry Equipment Co., of Harvey, Ill., are furnishing cranes, cupolas and core oven equipment. The S. Obermayer Co., of Cincinnati, O., are furnishing foundry supplies and facings for use in the model foundry. The supplies include shovels, riddles, brushes, bellows, and specialties of all kinds. In the way of facings they are furnishing plumbago, sea coal, core wash and blackenings. They also expect to exhibit in operation such little labor-saving devices as perforated tin chaplets, follow board compounds, and national iron filler cement. They will have in operation core machines, improved mold dryers, core ovens, resin grinders, etc.

The Tabor Mfg. Co., of Philadelphia, will exhibit one 14 in. by 16 in. power ramming split pattern vibrator molding machine, one 14 in. by 16 in. Draper-Tabor hand ramming combination stripping plate and vibrator molding machine, and one 32 in. power squeezer with vibrator frame and snap flask, also an exhibit of Taylor-Newbold saws. They expect that Curtis & Co. Mfg. Co., of St. Louis, will fit some of their patterns to their machines.

The Adams Co., of Dubuque, Ia., will have

several molding machines installed in the foundry.

Merritt & Co., of Philadelphia, Pa., will have some expanded metal lockers.

The Hill & Griffith Co., of Cincinnati, O., will have one of their patent core ovens, together with a few barrels of facings.

Curtis & Co. Mfg. Co., of St. Louis, Mo., have installed an 8 by 8 air compressor and one 4,000 pound direct acting cupola elevator, one small pneumatic traveling crane, and several air hoists.

E. E. Squier & Co., of St. Louis, Mo., are furnishing the molding sand, including fine brass, stove plate, light machinery, heavy machinery, car wheel, malleable, core and white sands.

The Midvale Mining & Mfg. Co., of St. Louis, Mo., will exhibit ground metals and alloys.

The Tower Grove Foundry Co., of St. Louis, Mo., will exhibit castings.

The Star Corundum Wheel Co., of Detroit, Mich., will furnish the wheels used on the grinding machines in the model foundry.

W. J. Keep, of Detroit, Mich., has forwarded a set of his machines for use at the foundry.

The Smokeless Fuel Co., of St. Louis, Mo., are to furnish the foundry coke.

The Ransom Mfg. Co., of Oshkosh, Wis., will exhibit one 18 by 2 in. motor driven dry grinder.

The J. S. McCormick Co., of Pittsburg, Pa., have furnished one 26 in. McCormick-Colliau cupola, together with the necessary connections for the same.

Power is to be furnished by a kerosene engine manufactured by the Perfected Kerosene Motor Co., of St. Louis, Mo. The work of installing the exhibits has gone forward rapidly, though many aggravating delays have hindered their progress.

NEW BOOKS.

"Methods of Chemical Analysis and Foundry Chemistry," by Frank L. Crobaugh, price $2.00. The first edition of Mr. Crobaugh's little work has been exhausted and he has gotten out a second and enlarged edition. The price of the first edition was $1.50, but on account of the increased size the price has been raised to $2.00. This little book does not pretend to be a treatise on chemical methods, but is a clear and concise statement of the experience of a practical chemist in using and applying chemical methods. It contains many hints, suggestions and cautions concerning the use of standard methods of analysis. The author has expressed his opinion as to which is the best method for each purpose and directs the chemist to the place where he can secure full information concerning the methods.

One valuable feature of the work is that the relative accuracy of the different methods is stated, and the limits within which analysis made by different chemists should check. Such facts as this are just what the practical foundry chemist or foundry manager wants to know. This book will be found of as much value to the foundry manager or the man in charge of the mixing as to the chemist, not only on account of the fact that it gives the limits within which different chemists should check, but also on account of the fact that it contains a large amount of useful information concerning variations in pig iron, the use of scrap and shot iron, the composition and use of coke, the figuring of foundry mixtures, the making of white and chilled irons, such as are used for malleable castings, chilled rolls and car wheels.

The composition of mixtures suitable for different grades of machinery castings is also given, including light, medium and heavy. One very interesting portion of the book is the treatment of the effect of the different elements on cast iron. The standard works on analysis, giving laboratory methods, and so on, would be found very dry reading to the average foundryman and would be of very little use to him, but this little book will be found of great interest in that it will enable the foundryman to interpret and apply the results obtained by the chemist.

TRADE PUBLICATIONS.

The Crocker-Wheeler Co., of Ampere, N. J., have issued two new catalogues entitled Bulletins 40 and 41. The first deals with the Crocker-Wheeler crane motors, including controllers and complete crane equipment. The second deals with the semi and fully enclosed motors for power purposes which are manufactured by this company. These motors are largely used for the direct driving of machine tools, and should find a special sphere of usefulness in a foundry where single machines are frequently located at a long distance from any source of power.

Warren, Webster & Co., of Camden, N. J., have issued a little booklet 3 by 6 inches, entitled, "A Little Calculation to Show the Saving Power of the Webster Water Heater." This little publication contains some facts

which will be of interest to all who have feed water problems to deal with.

The Northern Electrical Mfg. Co., of Madison, Wis., have recently issued two small folders treating of their motors for operating foundry equipment. The first shows the application of the motors for hoisting and racking in a special series of cranes, and the second an application of the motors to blowers and fans.

The Peerless Rubber Mfg. Co., of 116 Warren St., New York City, has issued an extensive catalogue covering the various lines which they manufacture, and deal in, including various styles of packing, belting, both rubber and leather, and hose, both plain and armored, together with many specialties that are of interest.

Fairbanks, Morse & Co., manufacturers of steam and power pumping machinery, have, during the past year, completed and equipped an entirely new plant at Beloit, Wis. and now have greatly increased and improved facilities for manufacturing pumps. The firm has issued a new catalogue describing pumps now manufactured and also giving directions for setting up and running pumps and making repairs, etc. A feature of the catalogue is useful information and formulae for capacities in connection with pumps. A telegraph code for the use of customers is also given.

Dean Bros. Steam Pump Works, Indianapolis, Ind., have issued a pamphlet describing their vertical double acting pump and jet condenser and other pumps which they manufacture.

Curtis & Co. Mfg. Co., of St. Louis, Mo., have issued a catalogue describing the Curtis compressors, pneumatic hoists, cranes, elevators and other apparatus manufactured by them. The catalogue is very neatly gotten up and printed, and contains considerable valuable information for all who are interested in this line.

The Falcon Bronze Co. Youngstown, O., have issued a catalogue describing some of their products in the way of bearings, acid-proof castings, etc. This company has made a specialty of acid-proof bronze castings for pickling crates and similar uses. The particular alloy which they use is named Falcon acid metal and they produce a very large variety of work from it.

"Hunting for the Leaks in Your Profits" was printed on an envelope distributed at the American Foundrymen's convention at Indianapolis. The envelope contained a circular upon Cost Systems, by Jas. C. Loughry, of Elyria, O., together with some printed matter bearing upon the subject. The whole was very neatly gotten up, and is an index of the careful way in which Mr. Loughry handles the work of his specialty.

The Woven Steel Hose & Rubber Co., of Trenton, N. J., are sending out a number of small leaflets and folders describing their cotton jacketed hose, their woven steel hose and their armored hose, which are some of the products which would be found of use in connection with foundry work.

George C. Rickley, owner of the Morris Foundry & Machine Shop, Morris, Ill., has sold the property to Samuel H. Tinsman.

The Chicago Pneumatic Tool Co. have issued a catalogue describing the air compressors built at their Franklin air compressor works. This contains illustrations and lists of sizes of a large number of compressors, together with much information of value relating to the erection, care and adjustment of compressors, the proper installation of air plants, etc.

The P. H. & F. M. Roots Co., of Connersville, Ind., have issued three very neat catalogues describing the Roots' rotary gas exhausters, the Roots' rotary pumps and the Roots' rotary blowers. The catalogues contain considerable information in regard to the capacities of cupolas when equipped with different sized blowers, and other matters which will be of interest to foundrymen.

Warren, Webster & Co., of Camden, N. J., have issued a neat little catalogue describing their feed water heaters and purifiers.

The Ingersoll-Sergeant Drill Co., of New York, are sending out an attractive little pamphlet issued by their pneumatic tool department, containing a full description and excellent illustrations of the construction of the Haeseler "axial valve" hammers. The publication also contains considerable matter which would be of interest to any one using this class of tools.

The National Electric Co., of Milwaukee, Wis., have issued a catalogue entitled "Bulletin No. 350," in which they describe their stationary and portable motor-driven air compressors. These compact little machines will be found very useful indeed for many purposes around manufacturing plants.

Warren, Webster & Co., of Camden, N. J., have issued a little folder 3x6 inches entitled "What Will Be Done With the Exhaust Steam?" This little publication will offer interesting reading for any one who is looking out for shop economy.

The Chicago Pneumatic Tool Co., Chicago, Ill., have issued a leaflet describing their Duntley air cooled electric drill.

The Frankfort Brass Works, of Frankfort, Ind., have published a very neat catalogue describing the plumbing specialties which they make.

PERSONALS.

Mr. J. B. Brown, Jr., formerly of the Stiles-Morse Co., of Chicago, has taken a position with the Falls Machine Co., of Sheboygan Falls, Wis., as traveling salesman.

Mr. John A. Dooley, who for the last three years has been working for the American Foundry & Machinery Co., of Chicago, left about June 16th to take charge of the Mexican National Foundry at Durango, Mexico, as general foreman.

DEATHS.

I. A. Finch, president of the Finch Mfg. Co., Scranton, Pa., died June 28 in New York, where he had been undergoing treatment for six months for kidney trouble. He was 67 years old. The Finch Foundry is one of the best known in the anthracite region.

Ex-Congressman Carlos D. Shelden died at his home in Houghton, Mich., June 24. Mr. Shelden was born in Walworth, Wis., June 10, 1840. After serving four years as a union soldier in the civil war he returned to Houghton. In 1872 he became manager of the Portage Lake Foundry, which position he held for eighteen years. He then became superintendent of the Shelden & Shafer Iron Co., Crystal Falls, Mich. He served two terms as a member of the Michigan Legislature and was a member of Congress from 1896 to 1902.

Ernest E. Mann died at his home in Detroit, June 17, from a stroke of apoplexy received five years ago. He was born in Ann Arbor and has been a resident of Detroit 30 years. He was for a number of years superintendent of the Michigan Radiator & Iron Mfg. Co., and when that company was taken over by the American Radiator Co., Mr. Mann was made assistant manager, which position he held until he was obliged to resign on account of illness.

Thomas Peat, for years superintendent of the Lloyd-Booth department of the United Engineering & Foundry Co., of Youngstown, O., died June 29. Mr. Peat was born in Staffordshire, England, in 1849 and in 1859 his family removed to this country. For 15 years he has been prominently identified with the above mentioned company. He had been prominent in the affairs of the city, with the Odd Fellows, and a leading citizen in other lines.

After a long illness, B. C. Trago, of Cleveland, who was well known in the pig iron trade, died at Cuyahoga Falls, O., aged 48 years. Mr. Trago was born at Jackson, O., and his entire business life was a salesman of pig iron. For a number of years he was in the employ of King, Gilbert & Warner, Columbus, O., and later was a traveling salesman for the Cherry Valley Iron Co. In 1896 he formed a partnership with W. G. Henderson, of Cleveland, the firm being Henderson & Trago, which continued in business until last January, when Mr. Henderson withdrew. Mr. Trago continued the business until last April, when he was compelled to retire on account of ill health.

Joseph Hinerth, president of the Highgate Foundry Co., died at his home in Highgate, Vt., June 11, aged 58 years.

FIRES.

The foundry of Round & Sons, of Traverse City, Mich., was damaged by fire on the night of June 23 to the extent of $1,500.

The foundry of the Buchanan Foundry Co., of Allegheny, Pa., was partially destroyed by fire on June 21. A number of adjoining buildings were also damaged.

A portion of the plant of the Rockmart Stove & Foundry Co., of Rockmart, Ga., was destroyed by a high windstorm on July 5. The damage amounted to about $1,000.

The foundry of Higgins & Chedister, of Joliet, Ill., was damaged by fire on June 26. Fortunately the fire was gotten under control before extensive damage was done.

Fire damaged the plant of the Northwestern Foundry & Supply Co. Detroit, June 18. Loss $5,000, covered by insurance.

The Victor foundry, of Indianapolis, Ind., was slightly damaged by fire on July 14th.

The Rundio foundry, of Williamsport, Pa., was slightly damaged by fire on June 17th.

The machine shop of the Winder Foundry & Machine Works, of Winder, Ga., was destroyed by a high wind storm on July 16th.

NEW CONSTRUCTION.

The old foundry of the Standard Machinery Co., of Mystic, Conn., is being demolished and a new brick building to be used as a foundry will be erected on the same site.

The Gleason Works, Rochester, N. Y., have purchased 20 acres adjacent to the yards of the New York & Hudson River railroad in that city. The purchase was made at this time because a particularly good opportunity was presented, but no building will be done this year. Next spring the company may erect a foundry building, but will not be ready to consider plans before Jan. 1. The transfer of the machine shop will be deferred until a still later date.

The Myrick Machine Co., Olean, N. Y., has enlarged its machine shop and doubled the capacity of its foundry.

The Delaware River Steel Casting Co., Chester, Pa., now has its plant in operation. The main foundry is 127 x 500 feet, equipped with the best modern machinery.

The Ensign Foundry Co. of Toledo, O., have had plans prepared for an addition to their plant 60 by 100 feet, to cost $8,000. The company makes a specialty of castings for automobiles and other purposes.

The American Foundry Co., Leipsic, O., recently incorporated has organized by electing the following officers: W. W. Edwards, president; J. H. Edwards, vice president; H. C. Edwards, secretary; F. D. Rosenberger, treasurer, and John McGlenn, manager. The company will put up a building 200 x 60 feet.

N. W. Harris, owner of the Ocala Foundry & Machine Works, Ocala, Fla., has purchased a new site to which he will move his foundry and machine works. The new plant will be considerably larger than the present one.

The plant of the American Castings Co., Birmingham, Ala., recently destroyed by fire, will be rebuilt on a larger scale. Considerable new machinery will be installed.

The Red Jacket Mfg. Co., Davenport, Iowa, will erect a foundry 85 x 200 feet. Complete new equipment will be required.

Halcomb & Millice, proprietors of the Topeka Foundry, Topeka, Kans., have begun the erection of a new foundry. The building will be the width of their three lots and 60 feet deep.

G. Walter Greene, Peterborough, Ont., will rebuild his foundry and machine shop recently damaged by fire. Plans for the new building call for about one-half more room in the foundry than there was in the old plant. A temporary building has been erected and as the cupola was very little damaged, castings are being made every day with a small force. Mr. Greene expects to have his new plant completed by September.

GENERAL INDUSTRIAL NOTES.

The W. G. Rowell Brass Foundry & Mfg. Co., of Bridgeport, Conn., has been incorporated with a capital stock of $50,000 for the purpose of doing a general foundry business. The incorporators are D. W. Rowell, W. G. Rowell and F. S. Hughes.

The Salem Iron Foundry Co., Salem, Mass., recently incorporated, has been in business more than twelve years without being incorporated. The company has bought the foundry department of the Salem Foundry & Machine Shop. The company will make a specialty of building and machinery castings. The plant is fully up-to-date and has a large variety of patterns.

The Dewey Sash Weight Co. has purchased the plant and stock of the Enterprise Foundry Co., Denver, Colo., and is continuing the business as heretofore and expect to increase its facilities.

The Standard Stove Works, Fort Payne, Ala., have constructed an addition to their foundry which will enable them to employ 15 more molders.

The Wheland Machine Works, Chattanooga, Tenn., are making additions to their plant which will cost about $50,000. The work on the foundry is being pushed as rapidly as possible.

The Wellsburg Mold & Foundry Co., of Wellsburg, W. Va., has been incorporated with a capital of $25,000. The incorporators are: Henry A. Stengle, J. G. W. Davis, and several others.

The DeRidder Foundry & Repair Co., Ltd., has been organized at Lake Charles, La., to make castings, agricultural implements and repair machinery. The officers of the company are: John W. Terry, president and general manager; Eli Vice, vice president; C. W. North, assistant general manager, and J. W. North, secretary and treasurer.

The Engineering Co. of America, with offices at 74 Broadway, New York City, has decided

to engage in general engineering construction and contracting, in addition to its strictly professional work.

The Dearborn Hardware Mfg. Co., of Oak Park, Ill., has been incorporated with a capital of $15,000. The incorporators are: R. A. Lackey, M. E. Wood, and J. A. Billings.

The Lafayette Stove & Foundry Co., Lafayette, Ind., has been organized and the following directors elected: John P. Gagen, Wm. H. Vawter, Joseph Gagen, Evan Shelby, H. S. Curtis, Frank Moore, J. Crouch and J. D. Bartlett. They have purchased an old factory in Lafayette, which they expect to remodel and make into a modern stove foundry. The capital of the company is to be $30,000. The company will be incorporated at once.

Adam Pyle, for several years an employe of the Standard Malleable Iron Works, will engage in business for himself in Muskegon, Mich. He is now erecting his pattern shop.

The Niagara Falls Machine & Foundry Co., of Niagara Falls, Canada, has recently increased its capital stock from $10,000 to $50,000, and elected the following officers: President, Ald. R. P. A. Slater; secretary, E. W. Symes; general manager, S. H. Brownlee, Niagara Falls, N. Y.

The Weatherford Machine & Foundry Co., of Weatherford, Texas, has been incorporated with a capital of $10,000. The incorporators are: E. A. Frantz, J. R. Lewis, W. E. Tate, S. S. Bedinger, Robert Barnhill, Hugh McGrattan and W. J. Milmo.

Barney Hall, of Portland, Ore., will build and equip a brass foundry in Grant's Pass, Ore. The foundry is intended for attending to repair work for the mines of that vicinity.

Allis-Chalmers-Bullock, Ltd., of Montreal, Canada, have taken over the Canadian business of the Bullock Electric Mfg. Co., the Canadian Bullock Electric Mfg. Co., Ltd., the Allis-Chalmers Co., the Ingersoll-Sergeant Drill Co., the Lidgerwood Mfg. Co., the Wagner Electric Mfg. Co., and the Canadian Engineering Co., Ltd. They have branch offices in Toronto, Vancouver, Winnipeg, Rossland and Halifax.

Richey, Brown & Donald, Long Island City, N. Y., will soon be in the market for equipment for their new plant. They will require a number of machine tools to be used for ornamental and structural iron work; also some foundry equipment, including a cupola. The machinery is to be electrically driven. They will also purchase boilers. A site has been purchased 450x700 feet, and they will erect a main building 60x500 feet. Several smaller buildings, which are already on the property, are to be remodeled.

Mr. W. D. Berry, formerly president of the Beaver Valley Metal Co., New Brighton, Pa., has let a contract for the erection of a brass foundry 38x71 feet. The foundry will have a capacity of 15,000 pounds per day, and will be equipped with the best modern appliances for turning out brass castings from ½ oz. to 6,000 pounds each. Castings will be made of brass, bronze, copper and aluminum. He also expects to manufacture Babbitt metal, solder and ingot metals. Mr. Berry has applied for a charter, with a capital of $10,000.

The Edward J. Etting Co., Philadelphia, Pa., have sold the good will of the business formerly conducted by the company to the former president of the company, Mr. Newbold Etting, who will conduct the business individually under the old firm name of Edward J. Etting.

At the annual meeting of the Altoona Foundry & Machine Co., of Altoona, Pa., on June 21st, the following directors were elected: Samuel M. Griffith, Joseph S. Sillyman, John A. Doyle, John O'Neil, C. H. Cassidy, M. V. Orner and H. K. McCauley.

The new foundry of the Johnston Frog & Switch Co., Chester, Pa., is nearing completion. The building is 80x200 feet.

The Reading Iron Co., of Reading, Pa., are erecting a new pattern shop. This is the first move on the part of the company for the improvement of the Scott works. It is understood that later they will erect a new foundry and steel plant and other buildings.

The Cincinnati Brass & Bronze Co., Cincinnati, O., has been incorporated with a capital of $5,000. The incorporators are: H. H. Suydam, A. H. Shoenberger, David Reese, Ernest G. Schulte and E. H. Bokenkotter.

The American Foundry Co., of Leipsic, O., has been incorporated with a capital stock of $50,000. The officers are: W. W. Edwards, president; J. H. Edwards, vice president; H. C. Edwards, secretary; Frank D. Rosenberger, treasurer; John McGlenn, manager.

The Jones Machinery Co. and the Ardmore Machine Shop, both of Ardmore, I. T., have been consolidated, making one of the largest and finest machine shops in the territory.

The Youngstown Foundry & Machine Co., of Youngstown, O., has increased its capital stock to $250,000, on account of the consolidation of the Youngstown Foundry & Machine Co. and the Youngstown Steel Casting Co., under the name of the former.

The Montpelier Foundry & Furnace Co., of Montpelier, O., has increased its capital stock from $10,000 to $25,000.

Within the next few weeks the yard and machinery for handling iron for the American Scrap Iron Co., Akron, O., will be largely increased. The company has been incorporated with a capital of $25,000 by Jacob Adler, R. Adler, Max Holub, W. Holub and Robert J. Chalmers. Formerly the company was capitalized for less than half of this amount.

The King & Hamilton Co., Ottawa, Ill., manufacturers of corn shellers, cultivators and wagons, has sold its plant at Morris, Ill., and will remove its equipment to Ottawa, where it will have more room and better facilities for doing business. The company will incorporate under the name of the Ottawa Foundry Co. It expects to be prepared for business at its new location within 90 days.

Miss Ella F. Jones plans to erect and operate a new plant for the manufacture of machinery at 104th street and Indianapolis avenue, Chicago. Since her father's death two years ago, Miss Jones has been manager of the Preble Machine Works at Ninety-first street and South Chicago avenue, employing 85 men. The South Park board recently bought Miss Jones' property. The new plant will be 75 x 300 feet in dimensions and will employ 150 men. The site is on the state boundary line. The plant will be in Illinois and the yards in Indiana.

The Cragin Foundry Co., of Chicago, has been incorporated with a capital of $50,000. The incorporators are W. L. Abbott, W. G. Carlton and S. J. Lumbard.

Bryant & Lee, foundrymen, of Minneapolis, Minn., have incorporated a foundry company with a capital of $50,000. The incorporators are J. W. and R. Bryant and H. L. and L. Lee.

George A. Polley, Albert A. Brandt and Frank J. Brown have organized a company and leased the Phoenix Iron Works, Winona, Minn., and will hereafter operate that business, which has been operated by a trustee since the death of the proprietor, W. M. Hurlburt, two years ago.

The Southern Steel Works has commenced the erection of a foundry in addition to its plant at Chattanooga, Tenn., the building costing about $30,000.

The San Jose Brass & Iron Foundry, of San Jose, Cal., has been incorporated with a capital of $25,000. They expect to carry on a general iron and brass foundry and machine shop, and to manufacture implements, engines, electrical appliances, etc. The incorporators are H. I. Howland, Orlin Wait, P. C. Doak, George Hanson and P. Bolan.

The Valley Foundry & Machine Works, established at Fresno, Cal., five years ago in a small shop, has moved into its new building, 70x100 feet, two stories, which is equipped with the best modern machinery. The company has been very prosperous and apparently has a bright future before it.

B. F. Sturtevant Co. announces the removal of its entire plant from Jamaica Plain to Hyde Park, Mass. With nine acres of floor space and all modern appliances the company will continue to manufacture the well known Sturtevant products:—blowers, engines, motors, economizers, forges, steam heating, ventilating and drying apparatus, etc.

The Van Der Wel Bros. have started a brass and copper foundry in Gloucester, Mass.

The Davis Foundry, Inc., of Hornellsville, N. Y., has secured the contract from the American Bridge Co. for building the iron columns for the new Sibley building in Rochester. This contract will require about 400 tons of iron to complete it.

The plant of the Empire Coke Co. at Geneva, N. Y., has started operations. The company was organized a year ago with nearly $1,000,000 capital and has a large plant covering three acres. Arrangements have been made to dispose of the by-products and gas will be furnished to surrounding towns. A pipe line has been laid from the works through Geneva, Waterloo, Seneca Falls and Auburn. The separate gas plants in these cities will be discontinued and the consumers will be supplied by the Empire Coke Co.

The Buckwalter Stove Co., of Pottstown, Pa., have recently completed an addition to their plant which is said to be one of the finest molding rooms in that section. It is equipped with modern appliances throughout.

J. Frank Harbster has leased the Central Foundry, Reading, Pa., and will conduct a general foundry business.

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CUPOLA SPARKS

Letters from Josiah Short, practical foundryman, to Jim, foundry superintendent, who has left the former's employ in the capacity of a molder to operate a new foundry.

Dear Jim:

About time you dubbed that flux "Fixitupright" a selling plater, after losing seven heats. Told you what to expect, but after all is said, that old adage about "Experience etc.," though frayed at the edges and threadbare, is still doing business at the old stand. Yes, business is not coming along on a 1:59 trot. Don't be discouraged. Yours is a new plant, and the iron you've used leads me to conclude that some of the castings made are only sought after when the other 7,000 shops in this country are filled up. I'm having little trouble in keeping my full quota of hands out of mischief. While my jobbing work is light, the output of machinery castings is as large as ever.

You know the old man's reputation in the machinery trade. I've made all the rest look like dandelions in a bunch of violets. Of course it's a secret process I use, but as I believe a filet now and then will be better for your digestion this winter than snowballs, I'll put you wise. High grade machinery castings—SOFT—STRONG—CLEAN. FORMULA:—IRON—REBECCA; Coke, any good grade. Trust, U R next.

Respectfully,

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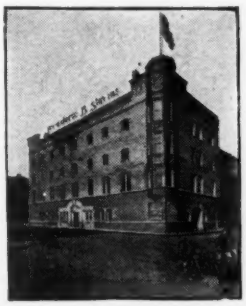
Spoiled a Suit of Clothes



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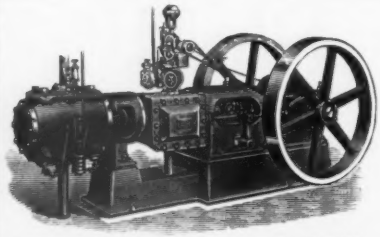

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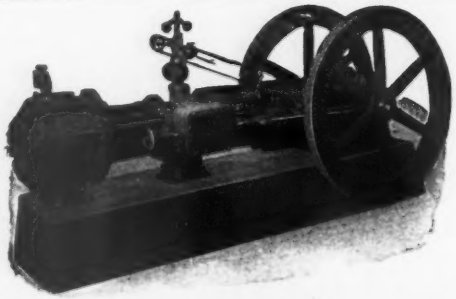

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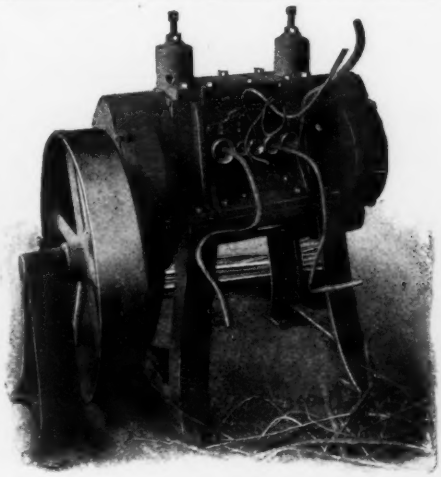

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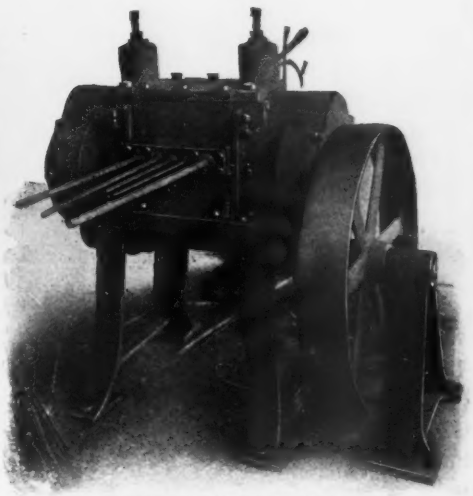

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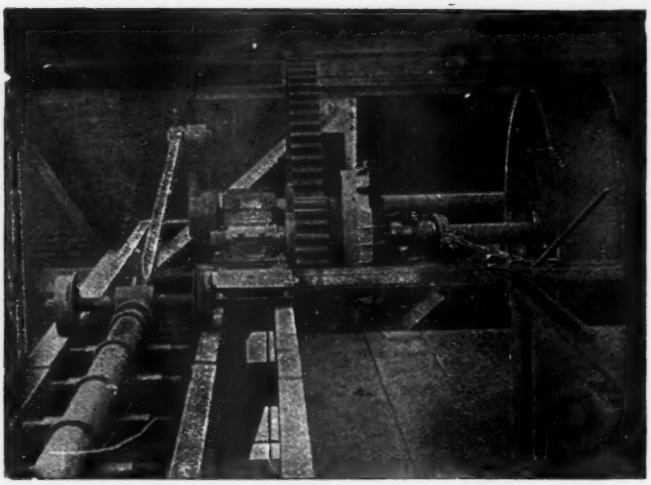

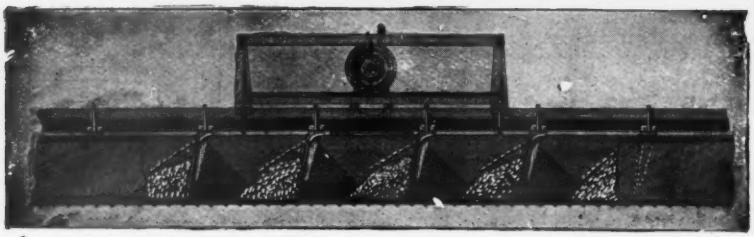

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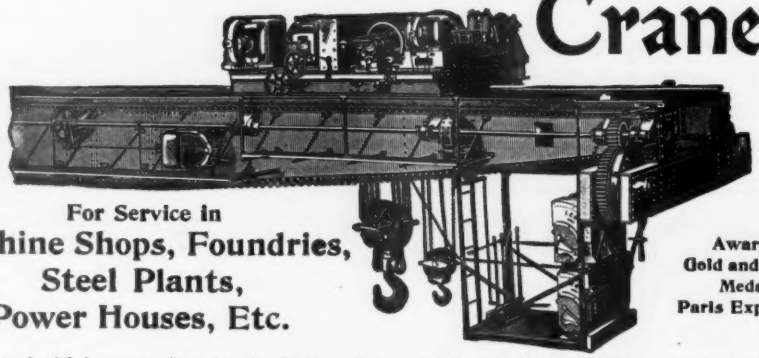

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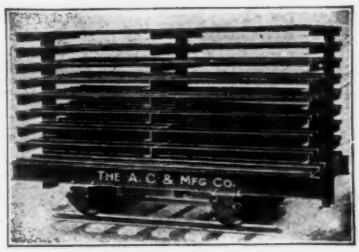

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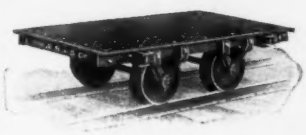

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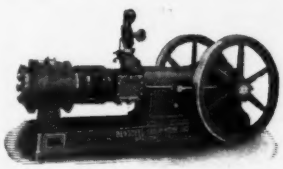

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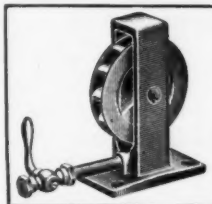

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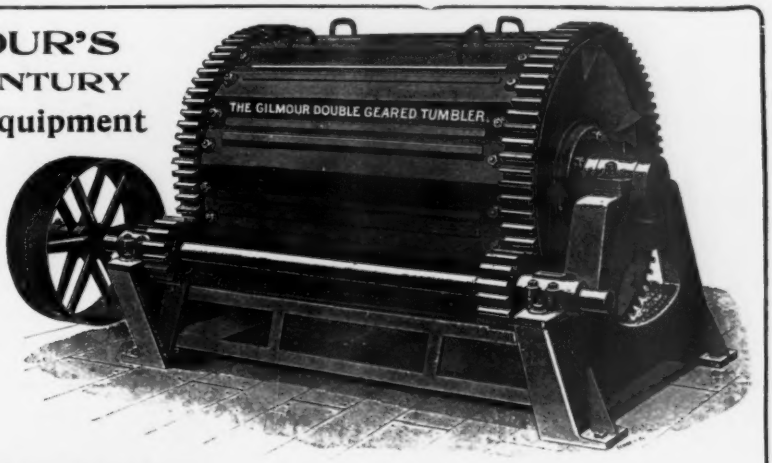

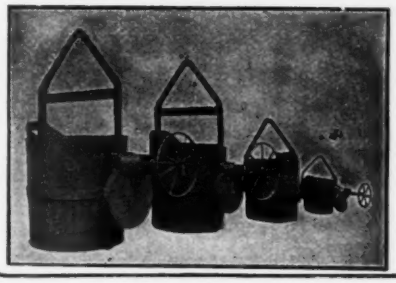

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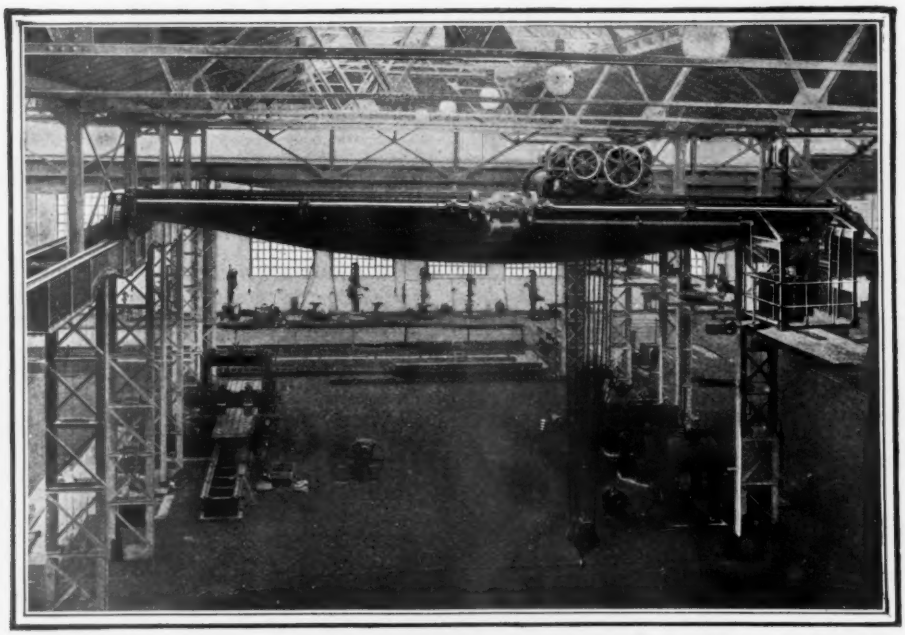

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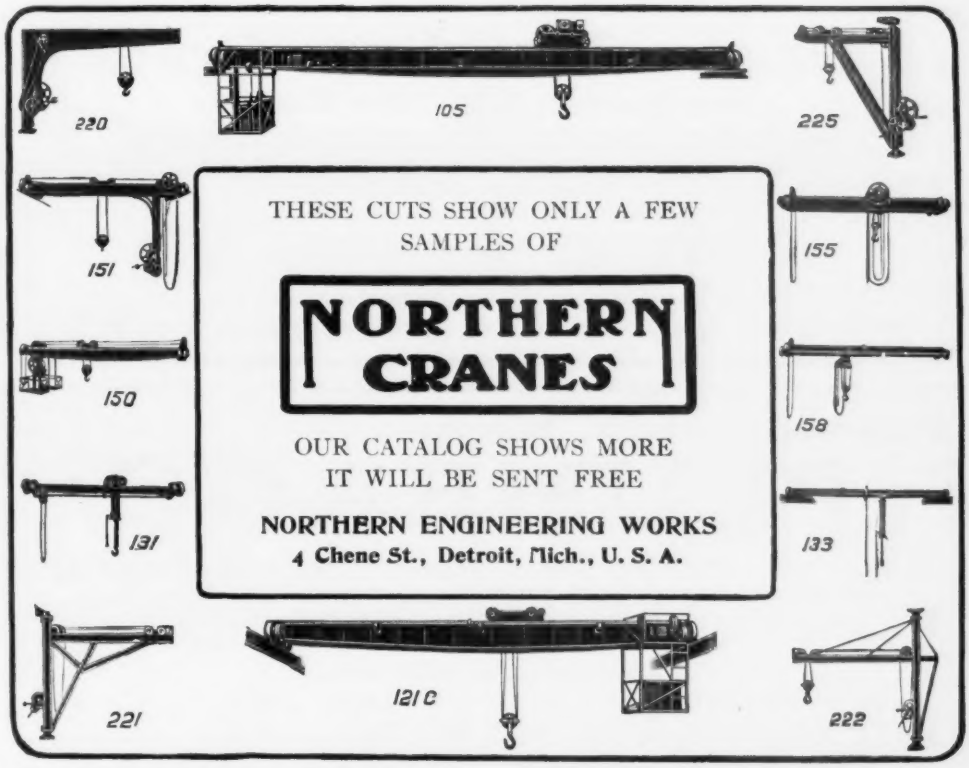

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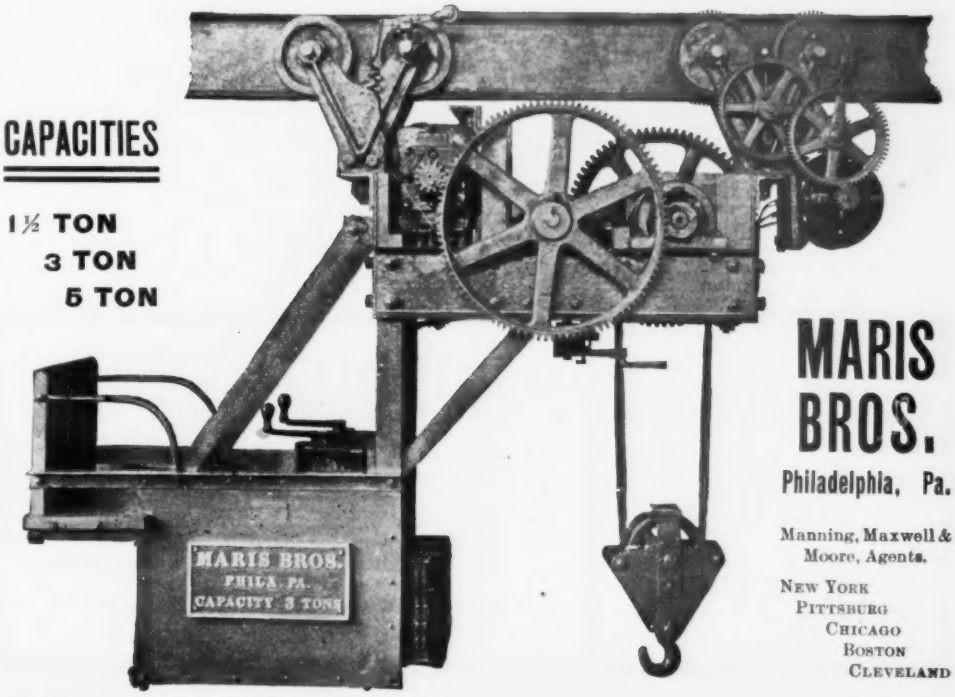

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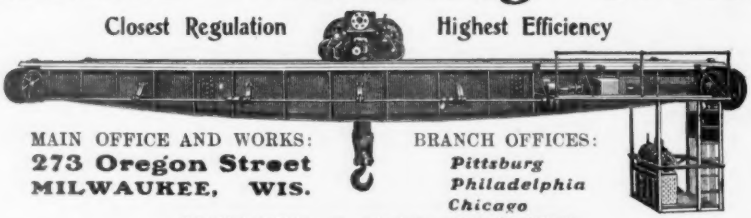

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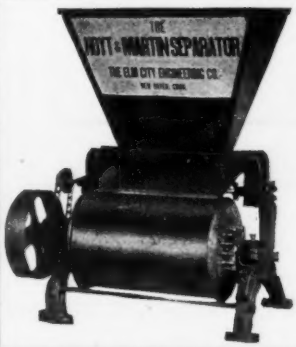

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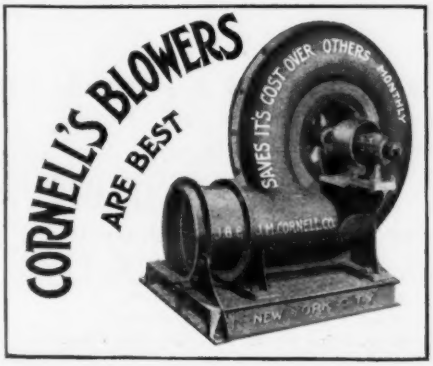

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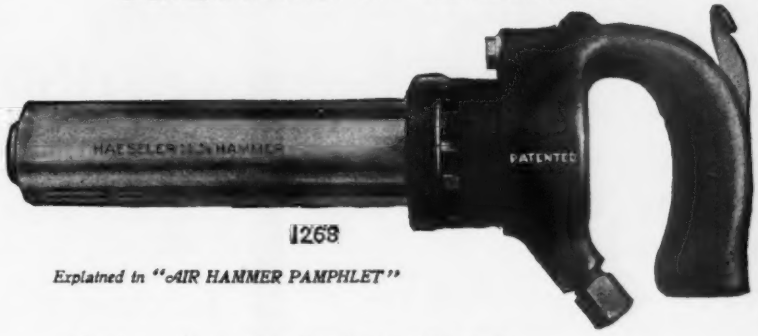

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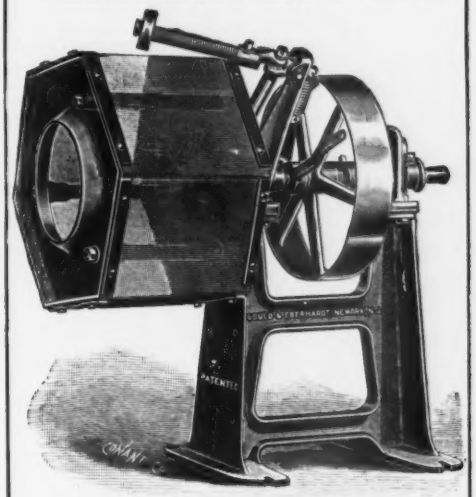

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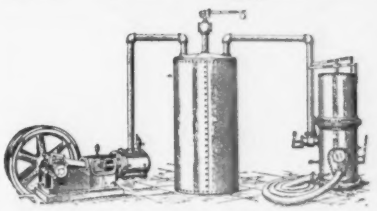
Sand Blast Apparatus



FOR

Cleaning Iron and Brass Castings—Cleaning Steel Castings—Cleaning Malleable Iron Castings — Cleaning Vessel Hulls—Cleaning Brazed Joints—Cleaning Cast Iron Bath Tubs and Plumbers' Goods, preparatory to enameling — Cleaning Structural Iron, Bridges, Etc.—Cleaning and Cutting Marble and Granite—Removing Discolorations from Overburnt Brick and Terra-cotta — Removing Glaze from Tile—Producing a Satin or Frosted Finish on Metals of all kinds—Cutting and Obscuring Glass

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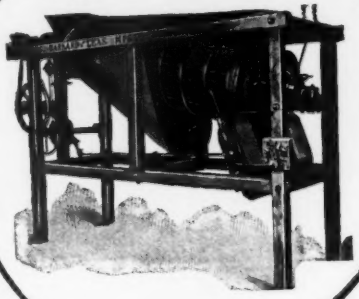

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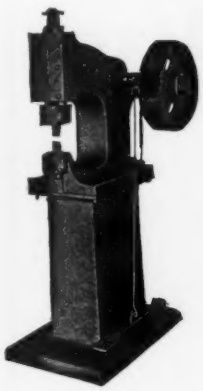

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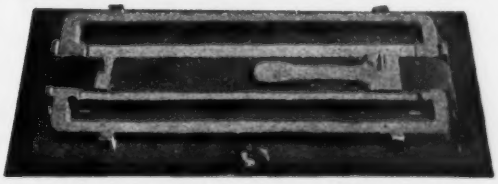

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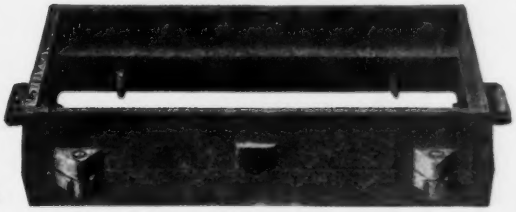

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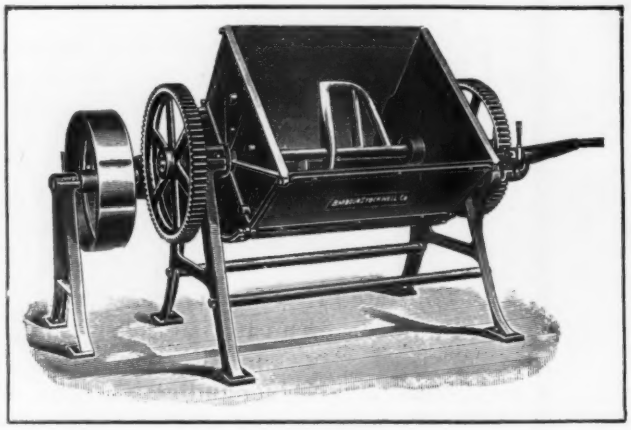

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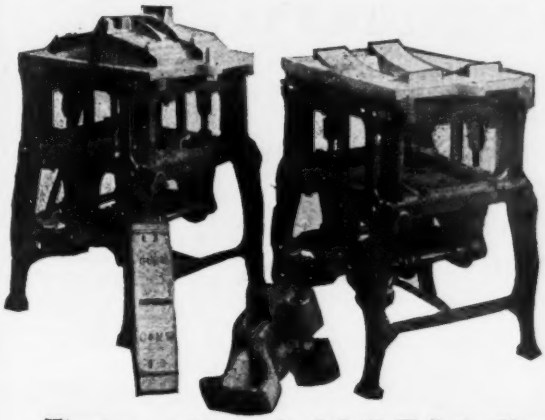

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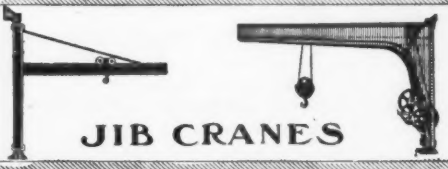

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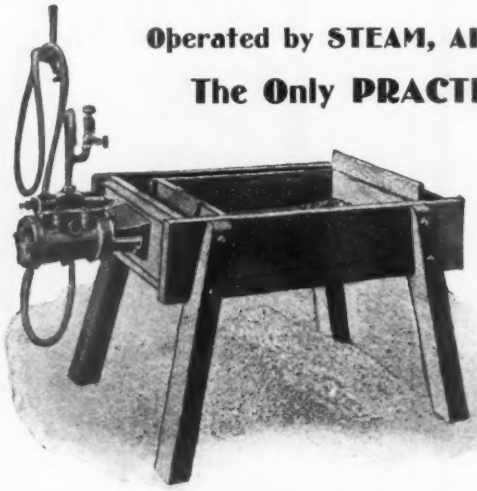

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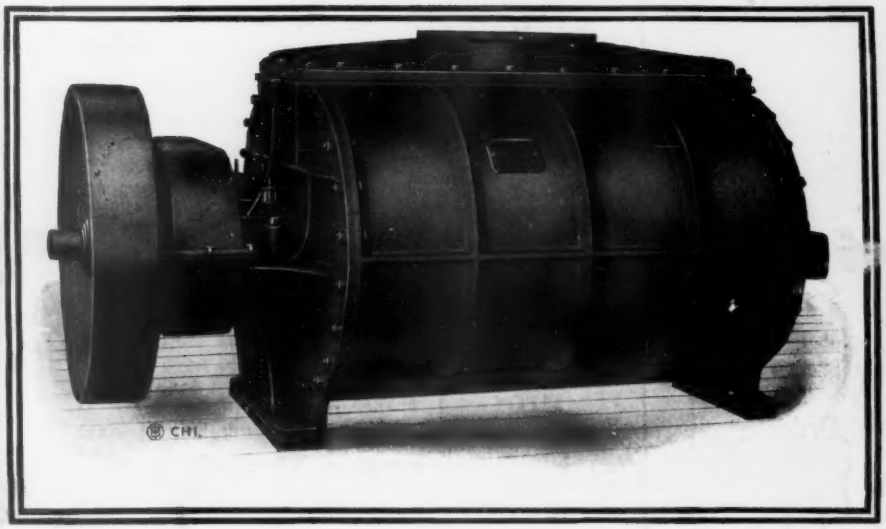

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